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LIGHT • HEAT • POWER • BYE-PRODUCTS

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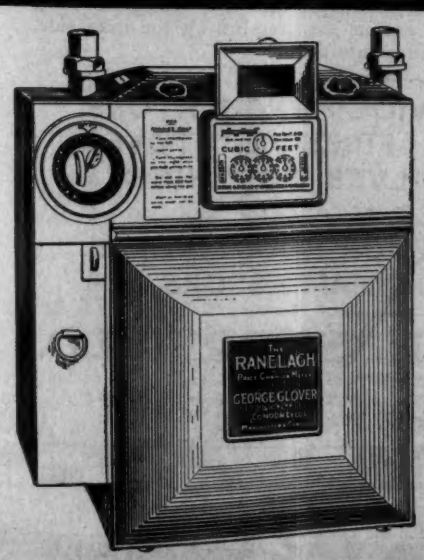

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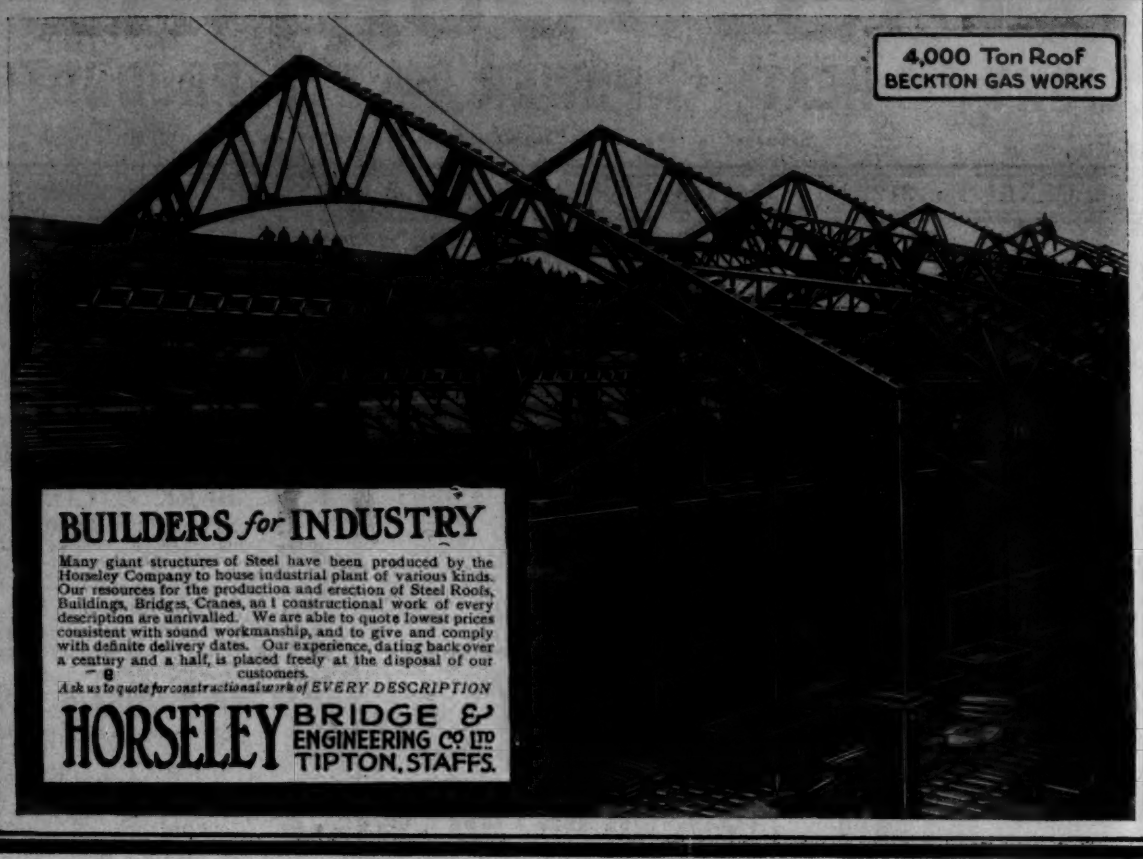

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EDITORIAL NOTES.

Pitch Price Propaganda Answered.

THE gas industry has naturally been keenly interested in the efforts that have been made by the South Wales Patent Fuel Manufacturers' Association—through the Press, by deputation to the Roads Board of the Ministry of Transport, and in Parliament—to depress artificially the market price of pitch to their own advantage, by the crude method of restricting or preventing its use for road making or maintenance purposes, and so to enlarge the available supply for briquette making. In the Press part of the campaign, Mr. Finlay A. Gibson, the Secretary of the South Wales Coal Owners' Association, who is generally a fluent and convincing writer—on other subjects—had a share. The two Associations are closely allied through proprietorship; hence the entrance of Mr. Gibson into this venture in the cause of self-interest. A letter to "The Times" by him revealed both the weakness of the case of the patent fuel makers and the singleness of their motives. As customary, Mr. Gibson was convincing on this occasion, but not in the manner desired. He presented the matter in such a way that there could be no mistaking the total disregard that those he represented had for the interests of others, so long as they could gain their purpose. The letter evoked a reply from Mr. Herbert W. Robinson, of Messrs. Robinson Bros., Ltd., the well-known tar and ammonia distillers—than whom a better exponent of their position the pitch producers could not have had. His reply led to a correspondence, which we have been asked to publish; and this we have pleasure in doing in later columns to-day. Anyone who can read with unbiassed mind, or can from intimate knowledge subject the correspondence to analytical examination, will see in this conflict of fact and argument who comes out far and away the victor. In both respects the correspondence leaves Mr. Gibson and those he represents out in the cold; and they stand convicted of a want of foresight and of intentions that are purely selfish, inasmuch as they totally ignore the interests of others.

Being such considerable producers of pitch, the gas industry is very largely concerned in this attempted method of limiting its use in one direction, in order to enlarge the availability of supplies in another, and so lower the market value. The patent fuel makers state that their industry is being ruined by the high price of pitch, and that it is the cause of much unemployment in it. Mr. Robinson shows that the basic material, and the cost-governing material, in the making of briquettes is the collieries' own small coal; and in the composition of the manufactured product this represents 90 to 92 p.ct., while pitch is only responsible for 8 to 10 p.ct. He also attributes the position of the patent fuel industry to lack of foresight on the part of its administrators, and shows that, while they are so clamant regarding the price of pitch, the briquette makers of Belgium and France are competing with each other for it at present market values. But the strongest point of all is the exposure of the unadulterated self-interest which takes no account of the fact that the interests of the important gas industry are concerned in the matter, as well as those of the millions of the population who use gas for light, heat, and power. In the price they have to pay for that gas, the revenue from pitch is not a negligible factor. But this is a matter of little moment to the briquette makers, while the law of supply and demand in its application to pitch is in favour of the gas industry and consumers of the country. They wish to violate that law by reducing the demand for pitch for road purposes by ensuring that road authorities shall use something of less merit for their purpose, and so increase the supply for, and largely confine the market to, briquette making. In this matter the ratepayers and the users of roads are concerned; but their interests obviously do not affect the makers of briquettes.

In the course of the correspondence, Mr. Robinson puts some pertinent questions to Mr. Gibson; and among them he asks why the gas undertakings, their consumers, and the proprietors should not receive the benefit of market prices for their tar. They have just as equal a right to this as the colliery owners and their workpeople have to receive the market price for their small coal. But we will leave the full correspondence to speak for itself. In it Mr. Robinson has not evaded a single point. Mr. Gibson is too busy a man to devote much time to the tight corner which he created for himself; and so those who do not think that the briquette-making users of pitch should have superior claims and privileges over other people must be content with just as much as he chooses to postulate. The correspondence is clear as to which side has the stronger case. It was Mr. Gibson who retired from an uncomfortable and untenable position.

Declared Quality and Therm Production and Costs.

THERE is in our columns to-day an article contributed by Mr. J. F. Tyndall, of the Deal Gas-Works; and we give hearty welcome to it, because it describes what is typical of the investigation that every gas engineer responsible for the operations of medium or small gas undertakings should make to decide for himself, *in his own present circumstances*, the quality of gas that should be declared, with an eye on the value of the therm into the gasholder, and the effects upon capital costs and depreciation of plant of those gases that uselessly load-up the general system, and some of which may have an accelerating action on deterioration. We want in the first place to guard—if that be necessary in view of his plain statement—Mr. Tyndall against criticism on the score of plant and working efficiency. For instance, we know nothing as to the quality of coal he carbonizes, of the ash and moisture content of the coke, and of the quality of the oil used. There are no data available as to coal carbonizing efficiency, coke gasification efficiency, and oil cracking efficiency. But we do know that he uses generator-fired hand-charged retorts, and that his water-gas plant is of the Humphreys and Glasgow type. He informs us as to his gas productions with these plants; and the thermal enriching value of his oil he takes at 100 B.Th.U. per cubic foot, or a therm per gallon per 1000 c.ft. of blue water gas. He presents his makes and his costs (including coal price) for coal gas of two qualities—540 and 500 B.Th.U., for blue water gas (with coke charged at local rates), and for water gas raised from 300 B.Th.U. to 400 B.Th.U. by the use of 1 gallon of oil per 1000 c.ft., and then for several mixtures, to ascertain the lowest attainable costs per therm into the holder for gas of various calorific values—all, we repeat, under Deal conditions as at present exising.

Mr. Tyndall holds that the reduction of calorific value per cubic foot can only be justified if, by so doing, the net cost of the therm into the holder is diminished; and no one can deny the soundness of that proposition. His production figures are all on the safe side. Examining them, it is seen that, in the current circumstances at Deal, it is better to make a coal gas of 540 B.Th.U., and to dilute it with blue water gas or a slightly carburetted water gas. A 540

B.Th.U. straight coal gas costs net into the holder 5·91d. per therm; but if this gas is diluted in the proportions of 2 to 1 of blue water gas so as to deliver a gas of 450 B.Th.U., the cost per therm into the holder is brought down to 5·48d. This is the lowest cost in the whole compilation. The next lowest figure to this brings out a significant fact. It is that there is equality of cost per therm between a 475 B.Th.U. gas (constituted of 3 parts of 540 B.Th.U. coal gas and 1 of 300 B.Th.U. blue water gas) and a 500 B.Th.U. gas (constituted of 3 parts of 540 B.Th.U. coal gas and 1 of 400 B.Th.U. carburetted water gas). In both cases the cost per therm into the holder is 5·59d. Between these two, there can no question as to which mixture it is the more economical to supply, particularly when it is noted that the inerts in the latter case are only 12 p.ct. (the same as in the straight coal gas), and consideration is given to the beneficial effects upon the distribution system and consumers' meters by (at any rate) a modest enrichment of blue water gas by oil, as presented and affirmed in the reports of the Gas-Meters Joint Committee. The 0·11d. difference in cost per therm as between the 450 B.Th.U. mixture of coal gas and blue water gas and the 500 mixture of coal gas and carburetted water gas may make all the difference to the final costs of the undertaking, though we question whether the consumer would appreciate the 11 p.ct. difference in the calorific value of the gas. But there we have it demonstrated by a variety of mixtures that, at Deal, a 540 B.Th.U. coal gas mixed with blue water gas, and providing 450 B.Th.U. gas for distribution, is the gas of lowest cost, and that the same quality coal gas mixed with slightly carburetted water gas, and providing a 500 B.Th.U. gas, comes next. These then are the calorific values to supply, under the stated conditions, and with the present plant; and between the two preference should be given to the latter, for known reasons.

Looking at the summary table in Mr. Tyndall's article, it will be observed that as the cost per 1000 c.ft. rises, the cost per therm descends. That is a point worth noting, though, of course, there would be a limit to this, and different conditions would promote different results. For instance, coal quality and carbonizing temperatures would be disturbing influences to any general application of the statement. But in the working circumstances at Deal, the fact supplies another piece of evidence as to the unreliability of costings at per 1000 c.ft., and as to the greater reliability that the therm brings into working computations. Every investigation goes to prove that, selling on the therm basis, it is too irregular and indefinite to attempt to determine on the volumetric basis the best gas or mixture of gas to supply, or the best calorific value to declare, in one's own special circumstances. This must be ascertained on the therm basis, and that alone.

Degradation of Efficiency by Hot-Plate Bars.

THE makers of gas-consuming appliances freely acknowledge that at one time their productions were designed and constructed without the aid of scientific investigation. Had it not been so, there would not have been room for the development of efficiency that has been witnessed the last few years, and which has come about as the direct result of scientific research. But it is sheer folly to obtain increased efficiency of an appliance, and then needlessly and deliberately introduce something which diminishes that efficiency. It is the recognition of this that has led to the doom of the continuous wrought-iron bars on the hot-plates of gas-cookers. The National Gas Council Committee on the Standardization of Gas-Cookers in their report emphasized the wastefulness of the continuous bars over boiling-ring burners, through their power of heat conductivity, and of the value of the open cast grid as an aid to efficiency. The loss and waste had before then been found by the cooker manufacturers, and had resulted in the change to the new grid-type hot-plate.

It was Dr. Carpenter who recently said that, within the limits of experimental error, boiling a kettle of water served as a good calorimeter. We are not persuaded as to this; but certainly in practical use one can ascertain with a kettle of water, under defined conditions, the relative efficiency to be obtained from boiling-burners. We are reminded of this by the paper that Mr. W. H. Sainsbury read before the Cornish Association of Gas Managers, in which he dealt with "Consumers' Complaints and Inquiries." In this he describes the homely experiment of boiling a kettle of water on a cooker, with cross-bars. A quart of water took 9 min. 30 secs. to raise to boiling-point; and the efficiency was only 27·3 p.ct. With the bars removed, the time for doing the same work was reduced to 6 min. 45 sec.; the consumption of 450 B.Th.U. gas was decreased by 1·35 c.ft.; and the efficiency was 44 p.ct. Even the latter is low compared with the latest types of burner and top grid. In the British Association Fuel Economy Committee's report published in the "JOURNAL" in September last, the highest value with specially designed appliances was 60 p.ct., the highest value with commercial appliances was 55 p.ct., and the lowest value with old-fashioned commercial appliances was 17 p.ct. The Gas Investigation Committee of the Institution of Gas Engineers and the University of Leeds have shown efficiencies with boiling-rings ranging between 40 and 45 p.ct.; but Mr. James W. Wood, the Research Chemist, said with slight adjustments and alterations an efficiency of from 50 to 65 p.ct., and even 70 p.ct., might be obtained. Dr. Harold Hartley was recently testifying to efficiencies ranging between 52 p.ct. and 59·4 p.ct., at different stages of B.Th.U. availability and different pressures. Sir Dugald Clerk does not see why efficiencies of over 70 p.ct. should not be realized with boiling-rings.

It is clear that much of the improvement in efficiency is due not merely to better burner construction, but to the removal of the bars over the gas-jets. There ought to be a big field of work here for stove manufacturers in supplying new tops for old-fashioned cookers, so giving the consumers greater efficiency, and thus economy in their gas consumption, with reduced bills. The domestic work done on the hot-plate represents about 80 p.ct. of that of the whole cooker; hence the importance of efficiency to the consumer. The ultimate cost per therm delivered to the consumer is a matter of consequence to him. When a low cost per therm is combined with a high efficiency in use, it is not only the consumer who benefits, but the gas industry and the makers of gas appliances as well.

Power Production in Relation to Ultimate Values.

A VERY useful paper was submitted by Mr. A. Hugh Seabrook to the Bradford Engineering Society at a recent meeting. It was on the question of power production; and part of its usefulness lies in the fact that it is of that class of thoughtful contribution to a subject which causes one to pause and to review one's own ideas in regard to it. Mr. Seabrook almost lets us into a knowledge of the contents of the paper through its title—"Power Production in Relation to Ultimate Values." Between the costs appertaining to centralized power production and the ultimate delivery to the consumers, there are costs which swell the production ones in a measure which is anything but negligible, though treated as such by some who profess and call themselves engineers. This is a matter of importance in considering such modern problems as the tendency of concentrating power production, and distributing over large areas. It is of consequence not only to the consumers, but, in the case of undertakings in which local authorities are concerned—such as the proposed super-power stations—to the ratepayers generally. Mr. Seabrook does not decry economy at the source of power production; but it is the ultimate result to the consumers in the whole area of distribution that is important. The paper constitutes a warning in this regard, and a timely one. It is an exhortation to consider final costs, and not only the costs of power generation, in order to decide the relative value of centralized production for extensive areas as compared with local stations or works.

Mr. Seabrook does not limit himself to electricity, but includes other public services—such as gas and water. Water has to be obtained from those places where Nature provides it, and from the sources that offer the most potable supply. The question is affected in the case of gas by the ability to store, and the application of high pressures; the whole distribution system in effect is part of the storage, and the same mains that will carry gas at low pressures have their transmitting capacity increased simply by the raising of the pressure at the producing end. In this case, the limit of the district of supply is only determined by whether or not the ultimate cost is higher than that at which a supply could be obtained from a gas-producing plant in the neighbourhood. Another consideration is that the gas is not the only product in a gas-works; and in a large works, the several processes supply great scope for technical and chemical supervision, and therefore economy

and efficiency which so largely affect the question of ultimate cost to the consumer. All the same, the test has to be applied as to whether consumers at a distance can be supplied as cheaply from the large gas-works as from a smaller works situated in the locality. Much in such a case depends upon coal availability, or the cost of delivering coal on to the works, though even in that case a lower efficiency might annul any advantage produced by the superior coal availability. No hard-and-fast rules can be laid down in this respect so far as gas is concerned; but this we do know, that there are many instances where consumers in somewhat distant outlying districts have, in the case of gas, found an immediate relief in the cost per therm or per 1000 c.ft. from the transfer of gas production from the small local works to larger ones at a distance. But, as previously indicated, every case has to be decided on its merits.

There are differences between gas and electricity. As Mr. Seabrook points out, any advantage in costs which concentrated generation may produce can easily be wiped-out by the capital, maintenance, and renewal costs in transmission; and this is why, particularly with electricity generated by steam-driven plant (water power in large quantities and other special circumstances are omitted), it is advisable well to weigh ultimate costs to the consumer before going to considerable lengths in transmission. If the ultimate costs are more than those of a local generating station, then the super-station is for that district not an economic proposition. It is abundantly clear that Mr. Seabrook is far from being an admirer of the super-power stations; and his attitude is founded on sound principles and logical reasoning. The farther the place of utilization from the power station, the more the relative importance of the fuel factor decreases, and the greater becomes the preponderance of capital expenses and overhead charges. Again, works costs may very often be low owing to a heavy capital expenditure; and it is conceivable that in some such instances a better ultimate value might be obtained by higher works costs and less capital expenditure. Broadly considering the subject, one has not to overlook possibilities in the development of the efficiency of the smaller power stations through improvements in internal combustion engines, the reduction in labour, and so forth. Even ten miles from the generating station, as Mr. Seabrook says, the cost of energy to the consumer may be raised to a point beyond that at which he could supply himself by means of a small and efficient plant, worked either by steam or an internal combustion engine. The price from the power station must, therefore, be one that will compete with the isolated plant and the improvements in its efficiency, and yet that price must carry in it a figure for depreciation, obsolescence, and antiquation in the super-power station and transmission plant, as well as the losses in the latter. There is much that cannot be ignored; and yet there has been insufficient attention paid to the aggregate of costs—consideration having been largely concentrated on works costs, which form but a small percentage of the ultimate expenses. These are all matters that every engineer dealing with production of power and heat energy—either by gas or electricity—should carefully weigh before coming to a final decision as to the relative ultimate cost to the consumer of supplying him from concentrated or from local plants. On the whole, though not claiming that there can be universal application, we think a stronger case can be made out for centralizing gas production for extensive areas than for centralizing electricity production, owing to the relative simplicity, in respect of the former, of the means of storage and transmission, and the large capacity that the same mains contain in relation to pressure employed.

A Level Gauge during Carbonization.

EFFICIENT carbonization can only proceed from vigilance over several details—constructional and operating. Even a plant ever so well designed to produce maximum gaseous thermal value (with the liquid and solid products coming second, though fortunately in these times having increasing consideration bestowed upon them), will not attain maximum results unless there is attention to the details of the working. In a paper read by Mr. W. H. Warren before the London and Southern District Junior Association, he raised several constructional and operating points—all relating to carbonization. He premised what he had to submit with the statement that in carbonization as practised there are two points of paramount importance: (1) The complete burning-off of the largest possible charge per cubic foot of retort space; and (2) the means employed to remove the gas from the retorts. Both these matters involve observation over various details. It is only to the second point that Mr. Warren gives consideration in his paper, though he does not suggest that the first one has not some bearing upon the second. Regarding the means of removing gas from the retorts, gas engineers have varying ideas; and if some of these which are more or less the survival of tradition were revised, the result would be an increased efficiency of retort plant which would influence the manufacturing costs per therm. There are matters dealt with in the paper that have often been in the arena of controversy; and each time things have been left very much where they were before, with continued division of practice.

In the first place, Mr. Warren considers the ideal condition that should obtain in the retort. That is the proper starting-place, because from it one can proceed to discuss detail by detail the conditions that are advisable to approach the ideal as closely as is practicable. Discussing the condition of vacuum or pressure which should obtain in the retort, it is submitted that, apart from causing leakage into or out of the retort, the effect of slight vacuum or pressure during carbonization is negligible. It is therefore obvious that the gas in the retort should be under barometric pressure in order to avoid leakage, either of gas from the retorts or of inerts into them. When a really good gas-tight retort is available, and not before, it will be possible to work at a vacuum of several inches of mercury, and avoid the necessity of the high temperatures now employed. As such retorts are not available, it would be well to maintain barometric pressure throughout the whole period of carbonization—that is to say, a level gauge. But this is an ideal condition, which we are afraid has not materialized as ordinary practice. Anyway, it could only be achieved by the correct design and working of the whole of the apparatus between the retort and the outlet of the house.

With the "level gauge" in view, Mr. Warren deals with each portion of the plant in turn. There has been a large amount of discussion as to whether through retorts should be fitted each with one or two ascension-pipes. Reasons are given by the author for preferring one of large capacity; and in this he has considerable support in practice, though there are good arguments in favour of dual pipes—such as the reduction of the travel of the gases as evolved through a considerable length of high temperature. But the balance of advantage lies with the one; and one pipe is all right if the condition of the charge is as it ought to be. But there are many of the older retort-houses where single ascension-pipes of larger diameter could not find accommodation, and so two have to be retained. The conventional method of sealing dip-pipes is attacked, as opposing, through the wash of the liquor causing oscillation, the realization of a level gauge, and supplementary are the irregularities of seal caused by the expansion and contraction of the settings. The variation of the rate of evolution of the gas from the charge during the carbonization period is another disturbing factor. Therefore, unsealed dips are favoured, with the use of some form of anti-dip when the retorts are opened for charging. But the *sine quâ non* is that the ascension-pipes must be of ample capacity. When these conditions obtain, the retorts are all kept under the same pressure or vacuum conditions. The Congdon standpipe possesses the property of vacuum compensation; and Mr. Warren calls attention to the lowness of the inerts where this device is in use. The correct functioning of the hydraulic main is next dealt with as being a vital factor in securing proper conditions of retort vacuum; and incidentally the author expresses his dislike of external tar-mains, whether of large or small diameter. He prefers a hydraulic main with the bottom falling generously towards the tar-tower. The design of the foul main is also discussed. The pressure thrown by a foul main, if correctly designed, would be negligible; and then only one retort-house governor is necessary—preferably a large one as being more efficient than a small one. Besides, there are several advantages in having a single governor rather than several small ones. It can be placed in a more accessible position, and away from conditions—such as heat and dirt—that are not conducive to life and the best working efficiency. Mr. Warren has his views, too, as to gauges, and has his preferences, which are described in the paper.

In these and other ways, the author gives information as to how he would arrange the retort-house equipment with the view to realizing the desirable—the maintenance of a constant pressure in the retort during the whole period of

carbonization, and in all the retorts simultaneously. That pressure should be atmospheric pressure. But the chief obstacle is the design of the ascension-pipes in most existing retort-houses. Towards the end of the paper, the author suggests an automatic system of control by the use of adjustable mercury contacts, attached to either side of the beam of a Wright's calorgraph (connected to the outlet of the exhauster), to operate relays which are used to load and unload the retort-house governor with water. The several matters to which Mr. Warren calls attention have a considerable influence upon make and quality (particularly the percentage of inerts); and losses of make and quality mean money. It is well known that in many retort-houses up and down the country the efficiency is not being realized that is possible, simply through the neglect of details in design and process. This is an avoidable uneconomy in working. Hence the advice so frequently given lately that there should be a thorough examination of retort-houses and practices in them to ascertain whether there is scope for improvement, and if so the means of effecting it.

Coal-Mining Working Hours.

The coalowners are going to press for a reversion to the eight-hour day. The owners' section of the National Coal Board have asked the miners' representatives to meet them to discuss the question. The invitation is to be accepted; but it is known beforehand that the miners' representatives will be there with the fixed intention not to consent to the proposal. It is something, however, to get them to agree to hear the views of the owners, which are bound to be discussed. It must be remembered that this is a question in which not only miners and owners are concerned, but the consumers generally. The owners hold that increased production through the re-establishment of the eight-hour day would increase wages and profits, and reduce unemployment. It is calculated that the extra hour and the "quick stroke" would result in an average saving of 1s. 9d. per ton, owing to the spreading over the larger tonnage of coal raised of fixed charges, on cost and time spent in getting to and from the face. The 1s. 9d. could be used either in reducing the cost of coal to the consumers, or in increasing the divisible profits, which are allotted to wages and profits in the proportion of 83 to 17. The miners' leaders urge that reorganization of the industry is what is really needed, and not a lengthening of the working hours. The Miners' Federation have asked for an inquiry into the conditions of the industry; but the Prime Minister does not think such an inquiry is necessary. Of course, the miners' representatives must realize that the improvement which has lately taken place in the volume of trade in coal has weakened considerably their demand for investigation.

The Corporation Tax.

The industrial group in the House of Commons have been considering the question of the reduction of taxation; and they are going actively to press the Government, among other things, to abolish the Corporation Profits Tax, which it is reckoned would mean a direct loss to the Exchequer of £19,000,000; but it would remove from industry and trade one of the shackles which are now encumbering them. But, on the other hand, there is not an insignificant element in the House that regards a general reduction of income-tax as the more important. We should like to see both the former abolished, and the latter reduced; but there is little hope at present of obtaining a mitigation of burden in all directions. Probably the general reduction of income-tax would gain the greater popularity for the Government, as all folk are not immediately concerned in providing for and paying out the Corporation Profits Tax, although, of course, they are indirectly. Public utility companies are exempt from the Corporation Profits Tax until the end of 1925. The Hon. Charles Napier Lawrence, when presiding at the recent meeting of the London and North-Western Railway Company, mentioned that the Directors have under consideration the question of the most effective means of influencing the Chancellor of the Exchequer to grant railway companies permanent exemption from what they regard as an unfair burden on the ordinary shareholders. In his opinion, the Chancellor would be well advised to repeal the tax entirely, as it is an undesirable burden upon trade, unfair in its incidence, and does not bring in anything like what was expected.

Piecemeal Legislation and Smoke Abatement.

In some fifteen Bills now being promoted in Parliament, local authorities have introduced clauses dealing with smoke abatement and offensive trades. This is considered by leading men in industry to be an undesirable method of attacking the problem. In consequence, the Federation of British Industries have made a move in the matter. A few days ago a deputation from the organization waited upon Lord Onslow at the Ministry of Health, and urged the undesirability of allowing the question of smoke abatement to be dealt with by varying clauses in Private Bills—particularly in view of the early introduction by the Government of general legislation on the subject. Touching this, Lord Onslow asked the deputation to let him have the views of the Federation for consideration when framing the Bill. Meantime, the Federation are making an effort to get the local authorities to suspend their individual proposals pending the proposed introduction of national legislation.

The Chemist in Industry.

There is no question that the chemist is gradually attaining his proper position in industry; for now manufacturers are progressively realizing the fact that chemistry is an important factor in the promotion and maintenance of efficiency, and efficiency means money. Over the larger recognition chemists are receiving there is gratification on the part of the President of the Institute of Chemistry (Mr. A. Chaston Chapman). At the annual meeting of that body, he mentioned that, although the supply of qualified chemists exceeds for the moment the demand, he does not think there is cause for serious alarm. The profession has attracted a larger number of young men during the last four years than in any previous corresponding period; but he is very optimistic as to the future of chemistry. It is a remarkable fact that, notwithstanding the increased output from the colleges, and the intense industrial and commercial depression, the new members of the profession are being steadily absorbed. This absorption may be taken as a definite indication that chemistry is now more highly valued by the manufacturer than formerly, and as evidence that the leaders of industry and commerce are turning more and more to science to assist them in the solution of their many and varied problems.

Claims of Research.

Last week, reference was made to the munificent gift that Sir Alfred Yarrow has made to the Royal Society for the promotion of scientific research. Since then a report has been published of a meeting held by the British Science Guild at the Mansion House. The statements made on the occasion show the backwardness of this country compared with others in encouraging research, though matters in this respect have much improved since the Guild was founded in 1905. We do not say that the sole cause of the improvement is the Guild; but it has rendered considerable help in prosecuting the claims of research. During the proceedings, the President (Lord Askwith) read a letter from Prof. Sir Joseph J. Thompson, in which it was truly stated that the remarkable opportunities for scientific research which have been opened up in the last thirty or forty years have not been accompanied by a proportionate increase in the means of bringing matters of scientific interest before the great mass of the people. Among the speakers was Sir Ronald Ross, who strongly pleaded for the provision of more money for research work and discovery. He asserted that in the whole of Great Britain only about £250,000 is being devoted annually to scientific investigation; whereas America is spending three to four times that amount. A resolution was passed expressing the opinion that the progressive use of scientific knowledge is essential to industry and commerce. We should hardly have thought that to-day such a formal expression of opinion was needed.

Carburant National.

It is learned from Paris that the Senate has adopted "National Carburant," which simply means that France is going to utilize its surplus wine for transformation into industrial alcohol, which will be utilized for blending with petrol. This will make France largely independent of imported petrol; and there are great expectations that the country will be much better off in pocket in consequence. It is not only with the view to add to the industrial prosperity of the North of France that this step has been

taken, but France has in mind its position in time of war, and regards this provision as one of national defence. In this country, there has been considerable investigation to ascertain the prospects of obtaining power alcohol at a commercial price for blending with home-produced benzole; but we are not so happily situated as France in this respect, and investigation has not done much to brighten our prospects in this regard.

Benzole and Alcohol and Taxation.

But we rather think that Dr. Ormandy is inclined to the view that power alcohol is coming in this country with a strength sufficient to make its influence felt. A few weeks ago, at a sitting of the Committee on the Taxation of Motor Fuel (the Chairman of which is Sir Henry Maybury), Dr. Ormandy expressed the opinion that home-produced benzole and power alcohol should be excluded from any scheme of taxation; for it is more important from a national standpoint that these young industries should be encouraged than that a small amount of revenue should be collected from them. He advocates the development of the low-temperature system of coal carbonization, which, in his opinion, would progressively result in the production of large quantities of benzole. There was some question as to whether this would not seriously reduce the income from a tax on motor spirit; but Dr. Ormandy is of the opinion that the normal growth in the requirements of motor fuel will exceed for many years to come the possible production from low-temperature coal distillation. In other words, the natural increment of revenue from petrol will be greater than the loss of revenue owing to low-temperature carbonization, and the production thereby of motor spirit.

"It's an Ill Wind that Blows Nobody Good."

With the cessation of the supply of all primary chemicals from the carbonization of Ruhr coal, Germany has stopped the export of the materials for dye manufacture; and this has diverted more foreign orders to this country. British makers—particularly the British Dyestuffs Corporation—are, it is reported, now supplying about nine-tenths of our home demands; and this condition, with the orders from abroad, is giving to the dye position in this country a more flourishing complexion. The British Dyestuffs Corporation are now producing 1250 varieties of dyes.

Summer Time in France.

It is estimated that an extra hour of daylight during the summer months saves France some 200,000 tons of coal a year. Last year the Chamber of Deputies decided that summer time should not be re-established there; but there has since been a strong movement in its favour, with a weakening of the opposition in the agricultural districts. Now the French Government are proposing to demand the re-establishment of summer time; and a Bill with this object will shortly be laid before the Chamber. At present the idea is that clocks should be advanced by one hour on the last Saturday of March, and not be readjusted to normal time until the first Saturday in October. After discussion with the British Government, there may be a modification in respect of duration.

Gas as a Fuel.—The Institution of Heating and Ventilating Engineers are to have a lecture next Friday evening (the 9th inst.) by Mr. J. G. Clark, F.C.S., on "Gas as a Fuel." The meeting is at 7 o'clock, at the Engineers' Club, Coventry Street, W.

Scottish Junior Gas Association (Western District).—A lecture on "Gas Lighting" is to be given by Mr. J. D. Lofts (Director of Messrs. William Sugg & Co.) in the Royal Technical College, Glasgow, next Saturday evening, at 7 o'clock. Other arrangements include a visit to the gas-works at Port-Glasgow on March 24, and the annual social on April 7.

"Gas Salesman" Corrections.—Attention has been called to three errors which unfortunately crept into the February issue of the "GAS SALESMAN." In the second column of the editorial on "Training and Examination of Salesmen," Mr. F. W. Goodenough is quoted as saying: "Selling is a *service* just as much as manufacture is a science;" whereas what he actually said was: "Selling is a *science* just as much as manufacture is a science." Again, in the report of the Midland Gas Salesmen's Circle Meeting, Mr. R. J. Rogers is reported as saying, in the course of the discussion [p. 34], that a sixpenny slot-meter is quite insufficient. This should read: "A sixpenny slot-meter is sufficient." Among the Committee of the Manchester District (West Riding of Yorkshire Section) Gas Salesmen's Circle, the name of Mr. E. A. Leask, of Leeds, should be substituted for that of Mr. T. Went.

PERSONAL.

The staff and employees of the Belfast Gas-Works met in the offices, Ormeau Road, to bid farewell to Mr. ALBERT E. PURDY, on the occasion of his retirement after 37 years' service. The company were received by Mr. J. D. Smith, the Engineer and Manager; and Mr. A. M'L. Cleland, Distribution Superintendent, referred to Mr. Purdy's personal and business qualities and to his popularity, and wished him long years of enjoyable leisure. At Mr. Cleland's request, Mr. Smith presented Mr. Purdy with an illuminated address, a Chesterfield lounge, and an easy chair, in token of the esteem in which he is held. Mr. Purdy suitably acknowledged the compliments paid him. Those present were afterwards hospitably entertained by Mr. Smith.

The wedding will take place at St. Luke's Church, Maidstone, on Wednesday, April 4, of Captain RALPH STALEY, M.C., R.E., the Engineer and Manager of the Bishop's Stortford, Harlow, and Epping Gas and Electricity Company, and Miss Jean Chapman, who is a niece of the late Col. Robinson, of the Liverpool Gas Company.

Mr. BEAUMONT HUDSON, Assistant Manager to the Normanton Gas Company, has been appointed Gas Manager to the Pontefract Corporation, at a salary of £300 per annum, with house, &c. There were 81 applicants. Mr. Hudson is only 25 years of age.

Mr. A. DRY, Coke Salesman to the Birmingham Gas Department, has retired upon attaining the age limit of 65. He was the oldest servant of the department, having started at Windsor Street in 1872, with the old Gas Company. Since 1901, he has been coke salesman at the Birmingham Council House.

A "Berkeley" armchair has been given by the staff of the Accrington and District Gas Board to Mr. WILLIAM BARON, of Great Harwood, who has retired after 46 years' service.

ELECTRICITY SUPPLY MEMORANDA.

WHILE the therm agitation was on, the electrical papers and several electrical engineers girded at the therm as being a mystery unit to the consumers; some went so far as to call it a "stunt" and a "blind." Of course, they ought to have known better. Comparison with their own unit, and the heterogeneous tariffs, which the consumers do not understand, that they apply to their business, ought to have caused them to keep well away from an attack on something of an incomparably simpler form. They should have looked within before indulging in the silly antics over the therm of which some of them were guilty. Mr. William Cash, F.C.A., in a letter to us, supplies an illustration. He says that, when so much is being said as to the difficulty experienced by gas consumers in understanding the charges of the gas companies when based on the therm system, he should like to draw attention to a notice issued by the City of London Electric Lighting Company, Ltd., as to their charges and the "modifications" in their tariffs. "I assume," he writes, "that the 'modifications' are reductions in price; but I should very much doubt whether the statement of charges is so expressed as to be understood by the ordinary consumer." And then he adds: "Possibly a committee may be set up presently to discuss the question of the basis of charge of the electric lighting undertakings!" There would be some interesting revelations of muddle and defective bases of charge if such a thing happened. Fancy the rateable value and the floor area of houses and other premises being the "basis" of charge for electricity!

Confounding the Consumer.

The Modification.

The "modifications" in the Company's tariff of charges to which our correspondent alludes are "explained" to the consumers in the following terms:

> **The Company begs to announce further modifications in its tariff of charges for the supply of electricity, to which effect will be given as from the dates of the meter readings taken at the end of the December quarter, 1922:**
>
> **Lighting: In each of the winter quarters, 8d. per unit for the first 7 units per 30 watts connected, and in each of the summer quarters 8d. per unit for the first 3 units per 30 watts connected, and 2½d. per unit (*instead of 4d. previously charged*) for all energy consumed per quarter in excess of such quantities.**
>
> **The above scale is intended to ensure that a consumer will be charged for his lighting supply commensurate with the use which he makes of his total connected lamps. A number of units per lamp per annum (now reduced from 24 to 20) is charged at the higher rate towards meeting the cost of keeping available at any time, day and night throughout the year, the plant necessary for the supply of all the consumer's lamps.**
>
> **Power: 1½d. per unit consumed, and, in addition thereto, a fixed charge calculated at the rate of 10s. per quarter per kilowatt of connected demand.**
>
> **Heating: 2½d. per unit.**

What is the layman accustomed to buying things by weight, length, area, or volume to make out of this, to him, confused notice? He knows nothing whatever about "watts connected" or "kilowatt of connected demand;" and he has some aversion

to his rates of payment being on different bases for summer and winter quarters. There is a strong preference among Britishers for payment by flat rates, and, where possible, a discount for exceptional consumption or prompt payment.

Electric Arithmetic.

Another correspondent sends a cutting headed "Electric Arithmetic" from a newspaper. It calls attention to a notice received with the last quarterly accounts by the customers of the County of London Electric Supply Company. The notice was to the effect that the price of current was to be reduced. "The domestic rate," the newspaper report says, "is now 8d. per unit. In future it is to be 5½d. per unit, *plus* 50 p.ct." A little calculation shows that 5½d. *plus* 50 p.ct. equals 8¼d. But there is at the side of the notice in small type the words: "Subject to the maximum rates authorized under the Company's Provisional Orders." The maximum rate is 8d., so that the consumer will not be charged 8¼d. "In fact, he will be charged exactly as now." This is regarded as an unkind joke on the part of the Company. The consumers are no doubt still pondering over the meaning that the Company place upon the word "reduction." To return to our first correspondent, there is no question that the several bases of charge for electricity require critical investigation, and an attempt to find the correct one. Unaided, the electricity industry has failed in its numerous essays in this direction, which essays date from the time of its birth.

Coal Expenditure per Unit.

The "Electrician" recently made some comments on the divergence of coal costs per unit at various stations; and it suggested that the matter was one which should receive more attention. A correspondent has written to our contemporary pointing out that it would be fairer to the stations in the South if pounds of coal per unit generated had been taken as the basis of comparison, in view of the effect of the higher railway costs. Of course, one has to take into account the differences of conveyance charges when costs are under examination. But neither costs nor pounds of coal per unit generated afford any exact basis for comparison—at any rate, from the point of view of efficiency. Coal bought for boiler-firing varies considerably in its calorific power and other qualities. It would be much more to the point in comparisons of the efficiency of generation to ascertain the B.Th.U. expended per unit of electrical energy. But though this would be more precise, station engineers might not approve, in view of the fact that it would gravely emphasize the inefficiency of the electricity generation process. In these days, too, it would be better not to speak of "coal" used for generation. "Fuel" would be better, inasmuch as large quantities of coke are now employed with advantage for the purpose, either alone or intermixed with coal.

Not Immune from Troubles.

People in the electricity industry were recently talking about the "bad Press" the gas industry was experiencing. Now those who were then gleefully rubbing their hands are finding that in the papers the weaknesses of their own system are receiving unwelcome attentions. Within the last fortnight, a report has appeared in the newspapers of the death of a Caledonian Road restaurant keeper—Edilio Bellidori. It appears that he was engaged in the unexciting task of freeing a stopped sink-pipe; and apparently he was using an electric hand lamp with flexible attachment. The reports are not very clear as to what exactly happened. Anyway, Mr. Bellidori was heard to cry out for help, and then he dropped to the floor. The Deputy Electrical Engineer of Islington did not at the inquest deny that the man received an electric shock; and he stated that the voltage was only about 200, which, of course, the public know is in the ranks of common supply pressures. Last week attention was called to the annoyance that had been caused to members of the electrical profession by the reader of a paper before the Royal Photographic Society. In this the author called attention to the injurious effects of electric light upon the eyesight, though in mentioning the matter we pointed out that this could be mitigated by the adoption of the necessary fittings. Again, there have been repeated troubles with turbo generators lately; and several breakdowns of supply have been recorded. One of the collapses was at Lincoln, where the service was cut-off by the interference of mice and a cat with the proper functioning of the plant. A very little cause may result in whole districts being deprived of electrical energy. Last week a report was published of a breakdown at the Swansea Corporation Electricity Station, when in consequence three collieries and certain local works were rendered idle, and the tramways had to run a restricted service. In this case, the breakdown was followed by a fire at the station; but this fortunately was quickly extinguished.

Bad Times.

There has been interest in reading "Notes on Wiring," by "Megohm," in the "Electrical Times." He is a frank writer, and does not believe in hiding anything—his view obviously being that the best way to secure correction of defect is to make a disclosure of it. But as to that presently. The first note deals with the slackness of trade among electric lighting contractors; and not much ground is given for hope of immediate improvement. The writer says doubtless a normal state of activity will not be established until building work by the so-called speculative builders becomes more than an almost negligible proportion of the building work in progress, and the Rent Restriction Act is a thing of the past. There he dashes to the ground any expectation of an early extensive conversion of the builders in the way the electricians desire. Why is it with prices so much lower now speculative builders are not making a move, seeing that they know full well there will be complete rent decontrol in about a couple of years, and that those who have houses stand the best chance of tenants while there is still an admitted shortage? There is something more in the position than "Megohm" confesses he can understand; for he calls attention to a fact which causes him to "wonder." He says that one cannot but wonder that the increase in the number of small property owners during the last few years, owing to people being so frequently obliged to buy instead of to rent a house to live in, has not led to more wiring work. "The man who objects to wire a house for the ultimate benefit of his landlord should be less disinclined to do it if the house is his own, and its value is thereby increased by more than the cost of the wiring." The very fact that owner-occupiers are not changing the pipes that convey the agent for lighting to wiring for electric current is sufficient evidence that the suggested increased value that would be put into the house is to them something more abstract than real. But he thinks that, with the drop in prices of materials and labour, the contractor should be able to put up an attractive proposition to prospective customers. He next points to a phenomenon in electrical tendering. It was this—that in a recent case ten firms submitted for the wiring of a new building to a consultant's specification; and four first-class firms tendered within £25 of each other! It is not stated whether or not the architect had a shock. At one time the divergence between one firm and another would have been great. This close tendering is a testimony to hard times. Another evidence of them is furnished by the poor stocks at the showrooms of manufacturers and wholesale dealers; and there is but a small variety of designs from which to select. We seem to be pretty fortunate in the gas industry. There is an advantage in being able to offer a labour-saving service at a cheaper rate than a competitor.

Flex Capacity and Radiators.

Let us turn to another subject. At the season of the year when people require heat, they like to get sufficient of it, and have not patience with pretence. In view of this the 1-KW. electric heater has fallen into disfavour; and small wonder! Two and three KW. fires are the order of the day, where people have a preference—or fancy they have—for electric heating. In view of this, "Megohm" is of opinion that more attention should be paid to flexible cords; and with very good reason. If any strands are broken off, or are not in proper contact with the terminals at either end, the flex may be easily overloaded; and although it is hardly conceivable that sufficient heat would be developed to burn out the conductor or set fire to the insulator, there is no doubt the high temperature shortens the life of the vulcanized rubber. The writer knows of many cases where the flex sent out with radiators has to carry more current than the maximum allowed under the wiring rules of the Institution of Electrical Engineers for ordinary rubber cable of equal nominal section. "Megohm" also has a kick at the untidy appearance of the supply connections in the majority of houses, and even in public buildings; and this he thinks has largely come about through the division of responsibility between the supply authorities and the wiring contractors. Standardization he believes is the remedy.

The Draft Order for London.

The London County Council Special Committee on Electricity Supply are not at all satisfied with the draft Order and scheme issued by the Electricity Commissioners for London and the Home District. The Committee's report on the subject is an extensive one; and they show that in their judgment the Order requires amendment in several particulars. In the first place, they are of opinion that more extensive powers of control should be retained in the hands of the Joint Authority. Out of twenty-seven members, sixteen will represent the undertakers' interests; so that even if the Joint Authority is vested with wider powers, the Local Authority and Company Committees will still occupy a very strong position. It is felt, however, that the placing of powers in the hands of the Joint Authority as a whole is likely to operate in the interests of the public, and to conduce more surely to the adoption of a uniform electricity policy for the whole district. The Committee attach great importance to the inclusion in the Order of such provisions as may be necessary to safeguard the interests of the Joint Authority in the stations and other works of which it is, or will ultimately be, the owner. It is considered that provision should be made for individual stations and other works to pass entirely under the control of the Joint Authority so soon as their purchase is completed, with freedom to take such action with regard to their future operation as may be thought fit. Then in the opinion of the Committee, it should be made clear that capital stations are to be under the control of the Joint Authority *ab initio*. It is desirable, they think, that the Joint Authority should be given more voice in regard to the execution of the technical scheme. Machinery should be provided to deal with a possible situation which might arise if either Committee default in the carrying out of Part I. of the scheme on the lines laid down, or if they are dilatory, or do the work unsatisfactorily, or if they depart from the approved

scheme. The Committee point out that the technical arrangements set out in the scheme are somewhat indefinite, and that it would be easy for them to be departed from or varied. With regard to the suspension of purchase powers and the adoption of a sliding-scale of prices, it is suggested that it should be made clear by the Council that, so far as they are concerned, they cannot give any consent to the suspension of these powers, or discuss a period of suspension, until fully satisfied with regard to the protection of the consumers as to prices and other matters. There is a number of minor questions with which it is proposed to deal when the inquiry takes place. At the inquiry, the Council are going to press for these amendments in policy, as well as for others dealing with details.

MANCHESTER REGIONAL GAS INDUSTRIAL COUNCIL.

Success of Whitleyism.

The Fourth Annual Meeting of the Manchester Regional Joint Industrial Gas Council was held last week. The members accepted an invitation from Alderman Sir William Kay (Chairman), and the Lord Mayor, Councillor William Cundiff (Deputy Chairman of the Manchester Gas Committee) to visit the Bradford Road Gas-Works extensions. The inspection was much appreciated by the members, who are representatives of gas undertakings in Lancashire and Cheshire and of various trades unions, and the visit marked a new feature in the history of "Whitleyism." The Industrial Gas Council was the first of the public utility services to adopt the principle of a Joint Council. During its three years' existence it has standardized about ninety gas undertakings into zones, and has evolved an agreed schedule of rates of pay and working conditions affecting approximately 10,000 employees throughout the area. In addition it has dealt with over a hundred differences which have arisen from time to time between undertakings and the unions; and with one exception its recommendations have been accepted by both sides. Any one of these disputes might have been serious but for the mediation of the Council. Although two sharply divided points of view are represented, the past three years have proved that there is a common interest in the industry. In case of a dispute, the undertaking and the employees concerned are assured of a fair hearing, and the public are better served and safeguarded in this way. Mr. J. Williams, J.P., of the National Union of General Workers, was elected the Chairman, and Alderman F. S. Phillips, J.P. (Chairman of the Salford Gas Committee), Vice-Chairman for the ensuing year. Mr. J. H. Sillitoe, Gas Department, Manchester, and Mr. T. Prince, National Union of General Workers, were elected Employers' and Employees' Secretaries respectively.

THE BIRMINGHAM PRESENTATION TO THE DUKE OF YORK.

In last week's "JOURNAL" [p. 515], an illustrated account was given of the presentation made by Alderman J. H. Lloyd, Chairman of the Birmingham Corporation Gas Committee, to H.R H. the Duke of York, on the occasion of his visit to the Birmingham Section of the British Industries Fair. The Duke of York has sent to the Birmingham Gas Department a letter expressing his great appreciation of the gold cigarette case, and stating that the gift was also much admired by his fiancée, the Lady Elizabeth Bowes-Lyon.

A copy of the "JOURNAL" was sent to His Royal Highness; and the following gracious acknowledgment has been received:

Buckingham Palace,
March 2, 1923.

The Comptroller to the Duke of York is desired by His Royal Highness to express to the Editor of the "GAS JOURNAL" His Royal Highness's thanks for the copy of that publication, in which the Duke of York was most interested to read the article with reference to the gift made to His Royal Highness by the Gas Committee of the Birmingham Corporation on Feb. 22.

The Fair came to an end on Friday last. The business done generally was a considerable improvement upon that in recent years. It has been decided to hold the Fair next year in May.

MIDLAND JUNIOR GAS ASSOCIATION.

Mr. C. F. W. RENDLE (Redditch) presided at a largely attended meeting of the Midland Junior Gas Association at the Council House, Birmingham, on Thursday, March 1, when Dr. Harold Hartley (Chief Chemist, Radiation Ltd.), gave a paper on "Developments in Gas Appliances." The company included a number of visitors—Dr. E. W. Smith (London), Mr. J. W. Wood (Fuel Department, Leeds University), and Mr. B. J. Bell (Cardiff). The paper will be published later.

WHAT IS THE BEST QUALITY OF GAS TO DECLARE, IN THE INTERESTS OF SELLER AND BUYER?

ECONOMICS OF GAS MANUFACTURE AND DISTRIBUTION AS PRACTISED WITH HAND-CHARGED HORIZONTAL RETORTS GENERATOR-FIRED, AND HUMPHREYS-GLASGOW WATER-GAS PLANT.

By J. F. TYNDALL, of the Gas-Works, Deal.

A judicious mixture of theory and practice, served without unnecessary comment, leaving individual and local circumstances the deciding factor.

The highest limit of a useful gas to be satisfactorily applied for all general purposes, and the lowest, are matters of personal opinion bounded only by correct proportioning of apparatus, and the adequacy or otherwise of the size of manufacturing, storage, and distribution plant to deal with the B.Th.U. in the form of therms—not cubic feet—demanded by the consumer.

The following figures prove conclusively that on the thermal system of sale, the mere degradation of a gas adds nothing to its therm selling value, whatever happens to its volume, while loading it up with unnecessary inerts, which only take up the the valuable space in holder storage, distribution mains, services and meters, and affect detrimentally the flame temperature, and the useful life of metals and meter-leathers in contact. On the other hand legitimate dilution, especially with blue or lightly-carburetted water gas, under certain conditions of the residuals market shows decided advantages; but such dilution does not add B.Th.U. to the original for nothing. Legitimate dilution of straight coal-gas, by blue or lightly-carburetted water gas, is proved to be the only justifiable means of adding B.Th.U., where a lower declared calorific value is decided upon, for local reasons, than can be obtained from straight coal-gas. And where such provision does not exist, either by separate plant or steaming verticals, and coal-gas only is supplied, then it appears proved that whether straight coal-gas is made or various degradations are practised, no more therms are available for actual sale one way or the other; but the disadvantages of the presence of unnecessary inerts are avoided, by declaring a 500 B.Th.U. gas or over.

The following comparative figures are obtainable and maintainable with reasonably good coal, well worked settings and producers, and water-gas plant:

		Therms.
(1)	12,200 c.ft. per ton coal of 540 B.Th.U. gas produces.	65·88
(2)	13,000 ,, ,, ,, of 500 ,, ,, ,,	65·00
(3)	50,000 ,, ,, coke of 300 B.Th.U. (B.W.G.) produces	150·00
(4)	54,000 ,, ,, ,, and one gallon oil of 400 B.Th.U = 80 c.ft. produces	216·00
(5)	120,000 ,, ,, ,, of 104 B.Th.U. producer-gas	124·80

The last-named is of the following approximate composition:

	CO.	H.	CH_4.	CO_2.	N.	Total Inerts.	Total Combustibles.	Calculated Calorific Value.
P.Ct.	24	5	1	7	63	70	30	104·6

The following estimated inerts is contained in each:

(1)	(2)	(3)	(4)	(5)
12 p.ct.	15 p.ct.	14 p.ct.	12 p.ct.	70 p.ct.

By a mixture of the above gases, the following values are obtained:

(1)	To	13,000 c.ft. of 500 B.Th.U.	coal-gas, 83·5 p.ct. (15 p.ct. being inerts)
	add ⅛	2,170 c.ft. of 104 ,,	producer-gas, 16·5 p.ct. (70 p.ct. being inerts)
	giving	15,170 c.ft. of 425 ,,	mixed gas per ton of coal = 64·46 therms
	allowing	425 ,,	quality to be declared (24·0 p.ct. inerts).
(2)	To	13,000 c.ft. of 500 B.Th.U.	coal-gas, 87·5 p.ct. (15 p.ct. being inerts)
	add ⅛	1,625 c.ft. of 104 ,,	producer-gas, 12·5 p.ct. (70 p.ct. being inerts)
	giving	14,625 c.ft. of 456 ,,	mixed gas per ton of coal = 66·36 therms
	allowing	450 ,,	quality to be declared (21·9 p.ct. inerts).
(3)	To	13,000 c.ft. of 500 B.Th.U.	coal-gas, 95·0 p.ct. (15 p.ct. being inerts)
	add 1/20	650 c.ft. of 104 ,,	producer-gas, 5·0 p.ct. (70 p.ct. being inerts)
	giving	13,650 c.ft. of 481 ,,	mixed gas per ton of coal = 65·65 therms
	allowing	475 ,,	quality to be declared (17·75 p.ct. inerts).
(4)		13,000 c.ft. of 500 B.Th.U.	declared coal-gas per ton (15 p.ct. inerts) = 65 00 therms.
(5)		12,200 c.ft. of 540 B.Th.U.	declared coal-gas per ton (12 p.ct. inerts) = 65·88 therms.
(6)	To	12,200 c.ft. of 540 B.Th.U.	coal-gas, 67·0 p.ct. (12 p.ct. being inerts)
	add ⅓	6,100 c.ft. of 300 ,,	blue water-gas, 33 0 p.ct. (14 p.ct. being inerts)
	giving	18,300 c.ft. of 460 ,,	mixed gas per ton of coal = 84·18 therms
	allowing	450 ,,	quality to be declared (12·66 p.ct. inerts).

(6a) To	13,000 c.ft. of 500 B.Th.U.	coal-gas, 67·0 p.ct. (15 p.ct. being inerts)	
add ⅓	6,500 c.ft. of 400	,, carburetted water-gas, 33·0 p.ct. (12 p.ct. being inerts)	
giving	19,500 c.ft. of 466	,, mixed gas per ton of coal = 90·87 therms	
allowing	450 to 460	,, quality to be declared (14 p.ct. inerts).	
(7) To	12,200 c.ft. of 540 B.Th.U.	coal-gas, 75·0 p.ct. (12 p.ct. being inerts)	
add ⅓	4,067 c.ft. of 300	,, blue water-gas, 25·0 p.ct. (14 p.ct. being inerts)	
giving	16,267 c.ft. of 480	,, mixed gas per ton of coal = 78·00 therms	
allowing	475	,, quality to be declared (12·5 p.ct. inerts).	
(7a) To	13,000 c.ft. of 500 B.Th.U.	coal-gas, 75·0 p.ct. (15 p.ct. being inerts)	
add ⅓	4,333 c.ft. of 400	,, carburetted water-gas, 25·0 p.ct. (12 p.ct. being inerts)	
giving	17,333 c.ft of 475	,, mixed gas per ton of coal = 82·32 therms	
allowing	475	,, quality to be declared (14·25 p.ct. inerts).	
(8) To	12,200 c.ft. of 540 B.Th.U.	coal gas, 75·0 p.ct. (12 p.ct. being inerts)	
add ⅓	4,067 c.ft. of 400	,, carburetted water-gas, 25·0 p.ct. (12 p.ct. being inerts)	
giving	16,267 c.ft. of 505	,, mixed gas per ton coal = 82·11 therms	
allowing	500	,, quality to be declared (12 p.ct. inerts).	

NOTE.—In the foregoing calculations it will be observed that no air for revivification of purifiers has been allowed for. It will be obvious that this is generally practised, and in varying degrees from 2½ p.ct. to 5 p.ct. according to circumstances. The net result will be a lowering of the calorific value of any of these mixtures, an increase of inerts and some free O_2, but no addition of therms.

Allowing 10 p.ct. unaccounted-for gas, and 2½ p.ct. used on works, offices, &c., the following are the available therms saleable per ton of coal carbonized by the various methods described:

(1)	(2)	(3)	(4)	(5)	(6)	(6a)	(7)	(7a)	(8)
56·40	58·08	57·45	56·9	57·6	73·66	79·51	68·25	72·03	71·85

The following percentage of inerts will be in each:

(1)	(2)	(3)	(4)	(5)	(6)	(6a)	(7)	(7a)	(8)
24·0	21·9	17·75	15·0	12·0	12·6	14·0	12·5	14·25	12·0

A factor of consideration is the relative holder storage and distributing mains, services, and meters, as affecting the conveyance and storage of therms, in relation to volume to the consumer, and may be expressed by:

Make per ton in cubic feet ÷ make per ton in therms. Thus:

(1)	(2)	(3)	(4)	(5)	(6)	(6a)	(7)	(7a)	(8)
235	220	208	200	185	218	215	209	210	198

The lower the factor the less storage and distribution accommodation required.

Examining the cost of manufacturing the various grades of gas into the holder, the prices taken must necessarily vary in different districts and must be corrected accordingly:

Coal, carted and trimmed into stores	37s. 6d. per ton.
Average net price of coke and breeze	30s. ,, ,,
Average net price of tar	6d. per gallon.
Average net price of sulphate of ammonia (¾d. per lb.)	£7 per ton.
Net price received to clear surplus coke = 0·134d. per lb.	25s. ,, ,,
Coke required to produce blue water-gas (per 1000 c.ft.)	45 lbs.
Gallons of oil required to raise blue water-gas 100 B.Th.U. per c.ft.	1 gallon.
Coke required to produce producer-gas, per 1000 c.ft.	19 lbs.

These represent local figures, and it is claimed as justifiable to charge for water-gas making the price for coke which prevails, and would be accepted, for surplus coke in quantities.

Cost of manufacturing 300 B.Th.U. blue water-gas:

	Per 1000 C.Ft. d.	Per Therm. d.
(a) 45 lbs. average quality surplus coke at 25s. per ton = 6·03 d.	6·03	2·01
Water and fuel for boilers (average 7 tons at 14s. 10d. per ton) 1·5 + 0·8 on 840,000 c.ft.	2·30	0·77
Purification	0·30	0·10
Operator, boilerman and cokeman, general assistant, 3¼d.; and salaries, ½d.	3·75	1·25
Maintenance of plant	1·50	0·50
Net cost of blue water-gas into holder	13·88	4·63

(b) Cost of manufacturing 400 B.Th.U. carburetted water-gas:

	Per 1000 C.Ft. Made. d.	Per Therm Made. d.
42½ lbs. average quality surplus coke, at 25s. per ton	5·70	1·43
1 gallon gas fuel oil, at 5·3d.	5·30	1·32
Water 0·7d., and boiler fuel 1·37d.	2 07	0·52
Purification	0·30	0 08
Operators, cokeman, boilermen, and salaries	3·55	0·89
Maintenance of plant	1·50	0·38
Net cost into holder	18·42	4·62

NOTE.—The labour costs of blue and carb. water-gas are based on working the plant 16 hours per day, requiring two operators at 9s. 3d. per shift, one cokeman general assistant, and half wages of three boilermen, the other half being debited to coal-gas for provision of steam to works and furnaces and attention to engines, station meter, and governors.

Make of blue water-gas, 210,000 c.ft. per 24 hours, working two 8-hour shifts: 2 operators, at 9s. 3d. sh., 18s. 6d.; 1 cokeman, ,, 8s. od. ,, 8s. od.; 1½ boilermen, ,, 8s. od. ,, 12s. od.

300 blue water-gas = 38s. 6d. ÷ 130 thousands = 3·5d.
400 carb. water-gas = 38s. 6d. ÷ 140 thousands = 3·3d.
500 carb. water-gas = 38s. 6d. ÷ 150 thousands = 3·1d.

(1) Declared 425 B.Th.U. mixed coal-gas and producer-gas:

	s. d.	s. d.	Per 1000 C.Ft. Made. d.	Per Therm Made. d.
1 ton coal		37 6		
Less residuals for sale—				
Coke and breeze, 9½ cwt. at 1s. 6d. =	14 3			
Tar, 9½ galls. at 6d. =	4 9			
Ammonium sulphate, 20 lbs. at ¾d. =	1 3			
		20 3		
Net cost of coal		17 3	13·64	3·21
Wages 5¼d. and salaries ½d.			5·75	1·35
Purification			0·50	0·12
Works maintenance			10·00	2·35
Net cost into holder			29·89	7·03

(2) Declared 450 B.Th.U. mixed coal-gas and producer-gas:

	s. d.	Per 1000 C.Ft. Made. d.	Per Therm Made. d.
1 ton coal	37 6		
Less residuals as at (1)	20 3		
Net cost of coal	17 3	14·16	3·15
Wages 5¼d. and salaries ½d.		5·75	1·28
Purification		0·50	0·11
Works maintenance		10 00	2·22
Net cost of gas into holder		30·41	6·76

(3) Declared 475 B.Th.U. mixed coal-gas and producer-gas:

	s. d.	s. d.	Per 1000 C.Ft. Made. d.	Per Therm Made. d.
1 ton coal		37 6		
Less residuals for sale—				
9¾ cwt. coke and breeze at 1s. 6d. =	14 7½			
9½ gallons of tar at 6d. =	4 9			
Ammonium sulphate, 20 lbs. at ¾d. =	1 3			
		20 7½		
Net cost of coal		16 10½	14·83	3·14
Wages 5¼d. and salaries ½d.			5·75	1·21
Purification			0·50	0 10
Works maintenance			10·00	2·10
Net cost of gas into holder.			31·08	6·55

(4) Declared 500 B.Th.U. coal-gas:

	s. d.	s. d.	Per 1000 C.Ft. Made. d.	Per Therm Made. d.
1 ton coal		37 6		
Less residuals for sale—				
Coke and breeze, 10 cwt. at 1s. 6d. =	15 0			
Tar, 9½ gallons at 6d. =	4 9			
Ammonium sulphate, 20 lbs. at ¾d. =	1 3			
		21 0		
Net cost of coal		16 6	15·23	3·05
Wages 5¼d. and salaries ½d.			5·75	1·15
Purification			0·50	0·10
Works maintenance			10·00	2·00
Net cost of gas into holder.			31·48	6·30

(5) Declared 540 B.Th.U. coal-gas:

	s. d.	s. d.	Per 1000 C.Ft. Made. d.	Per Therm Made. d.
1 ton coal.		37 6		
Less residuals for sale—				
Coke and breeze, 10¼ cwt. at 1s. 6d. =	15 4½			
Tar, 10 gallons at 6d. =	5 0			
Ammonium sulphate, 20 lbs. at ¾d. =	1 3			
		21 7½		
Net cost of coal		15 10½	15·61	2·90
Wages 5¼d. and salaries ½d.			5 75	1·06
Purification			0.50	0·10
Works maintenance			10 00	1·85
Net cost of gas into holder			31·86	5·91

(6) Declared 450 B.Th.U. mixed coal-gas and blue water-gas:

	Per 1000 C.Ft. Made. d.	Per Therm Made. d.
Proportion 2 : 1		
2 portions of 540 B.Th.U. gas at 31·86 and 5·91	63·72	11·82
1 portion of 300 B.Th.U. gas at 13·88 and 4·63	13·88	4·63
	3)77·60	16·45
Net cost of gas into holder	25 87	5·48

(6a) Declared 450 B.Th.U. mixed coal-gas and carb. water-gas:

	Per 1000 C.Ft. Made. d.	Per Therm Made. d.
Proportion 2 : 1		
2 portions of 500 B.Th.U. coal-gas at 31·48 and 6·30	62·96	12·60
1 portion of 400 B.Th.U. carburetted water-gas at 18·42 and 4·62	18·42	4·52
	3)81·38	17·22
Net cost of gas into holder	27·13	5·74

(7) Declared 475 B.Th.U. mixed coal-gas and blue water-gas:

	Per 1000 C.Ft. Made. d.	Per Therm Made. d.
Proportion 3 : 1		
3 portions of 540 B.Th.U. gas at 31·86 and 5·91	95·58	17·73
1 portion of 300 B.Th.U. gas at 13·88 and 4·63	13·88	4·63
	4)109·46	22·36
Net cost of gas into holder	27·37	5·59

(7a) Declared 475 B.Th.U. mixed coal-gas and carb. water-gas:

	Per 1000 C.Ft. Made. d.	Per Therm Made. d.
Proportion 3 : 1		
3 portions of 500 B.Th.U. coal-gas at 31·48 and 6·30	94·44	18·90
1 portion of 400 B.Th.U. carburetted water-gas at 18·42 and 4·62	18·42	4·62
	4)112·86	23·52
Net cost of gas into holder	28·21	5·88

(8) Declared 500 B.Th.U. mixed coal-gas and carb. water-gas:

	Per 1000 C.Ft. Made. d.	Per Therm Made. d.
Proportion 3 : 1		
3 portions of 540 B.Th.U. gas at 31·86 and 5·91	95·58	17·73
1 portion of 400 B.Th.U. gas at 18·42 and 4·62	18·42	4·62
	4)114·00	22·35
Net cost of gas into holder	28·50	5·59

Summary.

Grade of Gas.	Make per Ton. C.Ft.	Make per Ton. Therms.	Therms Saleable per Ton Coal.	Net Cost into Holder. Per 1000 C.Ft. d.	Net Cost into Holder. Per Therm d.	Inerts P.Ct.	Storage Factor.
(1) 425 B.Th.U. mixed prod.-gas	15,170	64·46	56·40	29·89	7·03	24·0	235
(2) 450 B.Th.U. mixed prod.-gas	14,625	66·36	58·08	30·41	6·76	21·9	220
(3) 475 B.Th.U. mixed prod.-gas	13,650	65·65	57·45	31·08	6·55	17·75	208
(4) 500 B.Th.U. coal-gas	13,000	65·00	56·9	31·48	6·30	15·0	2·0
(5) 540 B.Th.U. coal-gas	12,200	65·88	57·6	31·86	5·91	12·0	185
(6) 450 B.Th.U. coal and blue water-gas	18,300	84·18	73·66	25·87	5·48	12·6	218
(6a) 450 B.Th.U. coal and carb. water-gas	19,500	90·87	79·51	27·13	5·74	14·0	215
(7) 475 B.Th.U. coal and blue water-gas	16,267	78·00	68·25	27·37	5·59	12·5	209
(7a) 475 B.Th.U. coal and carb. water-gas	17,333	82·32	72·03	28·21	5·88	14·25	210
(8) 500 B.Th.U. coal and carb. water-gas	16,267	82·11	71·85	28·50	5·59	12·0	198

The choice of a "best quality" gas to declare may be assisted by an exercise of figures on similar lines to the foregoing. These particular examples are chosen because of their close connections with the past, present, and immediate future work of the writer, and the prices applied are those at present locally prevailing. The fundamental principle always maintains relative cost prices between per 1000 c.ft. and per therm. Where available, a mixture of blue or lightly-carburetted water-gas with a rich coal-gas yields more saleable therms per ton of coal handled, costs less into holders, holds less inerts, and has a lower storage factor; all combined factors favourable to the best quality to declare in the interest of seller and buyer. Where such admixture is not available there does not appear any point in diluting or degrading a straight coal-gas, no additional therms are available for sale per ton of coal handled, costs into holder and storage factor are higher, whilst inerts are unreasonably high and do insidious damage to plant. Having satisfactorily settled the grade of gas which costs least into the holder is far from solving the problem. There are other aspects to consider, and by no means least is the capital charge to be loaded on to the net cost into holder. It may even occur that the capital charges of certain plant installed to put cheap therms into the holder may weight the ultimate selling price too heavily. Before the final choice is decided, careful consideration must be given to distributing the therms.

The factors influencing this may be placed in the following order:

(1) The capacity of existing holder-storage, mains, services, meters, and supply-pipes, to deal with the therms ultimately required by the consumers.

(2) The influence of inert gases, especially CO_2 and O_2, on (1), and the repair and maintenance of plant, both on the manufacturing and distribution side.

This influence is slow but sure, and it appears by no means clear, from the several declarations of calorific value already made, that those responsible have fully realised the effect on repairs and renewals of such plant as holders, purifier-covers, governor-bells, and station-meter drums, also meter cases and leathers, services, and, in a lesser degree, cast-iron mains, or the cost of the mechanical means often necessary to deliver therms, when declaring a low-grade gas. The ultimate effect of having prematurely to enlarge holder-storage, mains, services, and meters, and to repair and renew plant where low calorific values with high inert contents are concerned—is to add to the over-all cost of gas to the consumer—*i.e.*, the net cost of gas into holders, *plus* maintenance and renewal of both manufacturing and distribution plant, *plus* interest and other standing charges on capital, loans, and overdrafts, &c.—for the consumer has to provide for all the foregoing out of the price of gas. This completes the whole economic problem of "what is the best quality of gas to declare in the interests of suppliers and consumers?"

The writer ends this review as he began it in the first paragraph, "leaving individual and local circumstances the deciding factor," and if he ventures the opinion that the best-quality all-round profitable gas to manufacture and supply to-day is a 500 B.Th.U. mixed coal-gas and carburetted water-gas, it is because he is satisfied that it is the best suited to his local and individual circumstances. It is obvious from the summary tables that the therm system of charge has entirely altered the old-established volumetric system of adjudging the comparative economics and value of a gas, and for that reason alone should be welcomed by gas suppliers equally with buyers in their mutual interests.

NATIONAL BENZOLE COMPANY, LTD.

The New Managing Director.

The Directors of the National Benzole Company, Ltd., inform us that Mr. A. J. TIBBITT, who has acted in the capacity of

General Manager since the inauguration of the Company, has been appointed to the position of Managing Director.

Transactions of the Institution of Gas Engineers.—Acknowledgment is made of the receipt from Mr. Walter T. Dunn, F.C.I.S., the Secretary (and Editor of the volume), of a copy of the Transactions for 1921-22 of the Institution of Gas Engineers, which contains a report of the successful annual meeting last June, under the Presidency of Mr. Thomas Hardie, M.Inst.C.E., Chief Engineer to the Gas Light and Coke Company. There is also an account of the reception of the President (M. Robert Ellissen) and members of the Société Technique de l'Industrie du Gaz en France. Features which add greatly to the value of the book are repeated on the present occasion. Mr. A. V. Hendrickson adds a number of abstracts of papers relating to gas manufacture published between July, 1921, and June, 1922. The memoirs unhappily record the loss of some old and greatly respected friends in the gas industry.

THE PATENT FUEL INDUSTRY AND THE USE OF TAR ON ROADS.

Important and Instructive Correspondence.

Some important correspondence on the use of coal tar in road making has taken place between Mr. Finlay A. Gibson, Secretary of the Monmouthshire and South Wales Coal Owners' Association, and Mr. Herbert W. Robinson, of Messrs. Robinson Bros., Ltd., of Birmingham. We have been requested to publish the correspondence *in extenso*, and have pleasure in doing so. The correspondence opened with

A Letter to "The Times."

By Mr. FINLAY GIBSON.

[*Published Jan.* 29.]

The execution of road extension and improvement schemes for the relief of the unemployed has possibly much to recommend it; but we must not overlook the incidence on other industries of the use of certain commodities in connection therewith. On at least one of the subsidiary industries of coal mining the effect of the wasteful use of coal tar and pitch in road construction has been very serious. I am referring to the patent fuel industry, of which South Wales is the principal centre in this country.

The normal pre-war production of patent fuel in South Wales was about two million tons; and practically the whole of this was exported. The industry employs directly about 3500 workmen, and indirectly other labourers in transport work. The manufactured briquette consists of about 90 p.ct. of small coal and about 10 p.ct. of coal-tar pitch. The latter commodity is the only agglomerant that has been found commercially practicable. Many experiments have been made to discover another cheaper binding element; but so far they have been unsuccessful. Partly in consequence of the reduced production of tar, and partly as the result of the abnormal consumption of tar for road-making purposes, the price of pitch has advanced to phenomenal figures. The pre-war price was about 40s. delivered at works; while recently the price has been as high as from 140s. to 150s. per ton. The result of this increase in price has been an extremely acute depression. Consumers find it cheaper to buy large coal, and the industry of patent fuel making is threatened with extinction.

Relief could be obtained by restrictions on the wasteful use of tar for road-making purposes, especially in country districts. There are substitutes available for that purpose, but none as a patent fuel agglomerant. The Patent Fuel Manufacturers' Association have made representations to this end to the Roads Department of the Ministry of Transport. The manufacture of patent fuel is a considerable market for small coal, and practically the exclusive market for some qualities of small coals. The depression in the patent fuel industry is therefore reacting adversely on the mining industry itself. If the patent fuel works are closed down, there will follow stoppages at many of the collieries. These evils, however, may be mitigated, if not avoided, by the conservation, as far as possible, of the existing supplies of coal tar for distillation to produce pitch for patent fuel manufacture. But conservation is only obtainable by an abstention from the wastage of an extremely valuable coal bye-product in road construction; and such abstention is possible, as there are substitutes available.

Unless relief is obtained in this direction, increased unemployment in this particular industry, as well as in other branches, is inevitable, with a consequent additional burden on the National Exchequer.

Letter to "The Times."

By Mr. HERBERT W. ROBINSON.

[*Jan.* 21.]

Being responsible probably for the disposal of as large a quantity of the products of tar as anyone in the country, may I ask the Secretary of the Coal Owners' Association, whose letter you printed in your issue of the 29th inst., the following questions?

1.—Are not the patent fuel works largely owned or controlled directly or indirectly by the same interests as own or control the collieries producing the small coal which the patent fuel works use?
2.—Does not patent fuel consist roughly of over 90 p.ct. of small coal and less than 10 p.ct. of pitch?
3.—Does not the price of patent fuel therefore depend more upon the price of the small coal than upon the price of pitch?
4.—Have not the coal owners, who are also largely the owners of the patent fuel works, sold their small coal, or a very large proportion of it, to the French makers of patent fuel; and is not this one of the reasons for the present high price of small coal?
5.—Are not the French patent fuel makers working full time upon small coal thus purchased and upon pitch, for which they are willing to pay to-day's price?
6.—Were not the patent fuel makers during last summer offered pitch, which they refused to buy, at under one half of to-day's price, in spite of warnings of what was likely to happen to the market at short notice?

One story, Sir, is proverbially good until the other is told.

Every gas consumer, a very large proportion of ratepayers, every long-suffering shareholder in a gas company—that is to say, every one of many millions of people—is directly or indirectly interested in the price obtained by the gas producer for his tar and for the pitch contained in his tar.

Every ratepayer is interested, in common with every road user, in the proper construction and maintenance of good roads. Substitutes, although they may at some future time, after much experiment, be successfully used alone to make a reasonably good road, are at present, unless mixed with large proportions of tar, of very limited and doubtful service.

For every Britisher interested in patent fuel making, thousands are interested in the use of tar on roads; and a trade which has in the present case shown an astonishing lack of ordinary foresight should, I think, be ashamed to put forward such an extraordinarily weak case as is disclosed in Mr. Gibson's letter.

Letter to Messrs. Robinson Bros, Ltd.

By Mr. FINLAY GIBSON.

[*Feb.* 2]

I thank you for your letter of the 31st ult., which has been placed before me on my return from London, enclosing, at the request of Mr. Herbert Robinson, copy of his letter to "The Times." I am sorry that Mr. Robinson had not communicated with me in the first instance in order to ascertain the correct facts, and then, if he was not satisfied, he could have written to "The Times." It would have afforded me the greatest possible pleasure to have given him all the information he required; but I shall now have no alternative but to reply through the Press, if "The Times" publish his letter.

I shall be able to prove conclusively that practically the whole of his assumptions are incorrect, and that the use of substitutes for road making would not bring about unemployment, whereas the stoppage of the patent fuel works will do so, and will increase the burden of taxation.

I very much appreciate Mr. Robinson's courtesy in having sent me a copy of the letter which he has sent to "The Times," and I will write more fully on Monday or Tuesday next in reply to all his points.

Letter to Mr. Finlay A. Gibson.

By Messrs. ROBINSON BROS., LTD.

[*Feb.* 5.]

Mr. Herbert Robinson instructs us to acknowledge, with thanks, receipt of your letter of the 2nd inst., and to state that he awaits your further letter with interest.

Letter to Mr. Herbert Robinson.

By Mr. FINLAY A. GIBSON.

[*Feb.* 9.]

I am sorry that absence in London has prevented my writing to you earlier in reply to the points which you put forward in your communication to "The Times," dated the 31st ult.

I will now deal with them seriatim:—

1.—The patent fuel works are largely owned or controlled directly or indirectly by the same interests as own or control the collieries producing the small coal which the patent fuel works use.
2.—Yes.
3.—The price should depend more upon the price of small coal than upon the price of pitch; but it has not for some time past, neither does it at the present time, as the price of pitch has risen to such an exorbitant figure that it now represents more than the price of the small coal. The price of the latter fell considerably during October, November, and December. The owners are not allowed to sell small coal to their own patent fuel works at less than the market price—this being one of the conditions of the national agreement entered into between the owners and workmen's representatives. The owners, therefore, have no opportunity of supplying their own fuel works with small coal at a lower price than the market price, and cannot therefore equalize the increased cost of pitch by reducing the price of small coal.
4.—Small coal has been sold to French makers of patent fuel in consequence of there being no market in South Wales owing to the high price of pitch bringing the price of patent fuel out of all proportion to the price of large coal, the result being that there were no buyers.
5.—French patent fuel makers are not working full time; and I understand that briquette works, both in France and in Belgium, are now severely suffering in consequence of the increased cost of pitch.
6.—Fuel makers may have been offered small quantities at relatively low prices, but even then the price was more than the trade could pay. Moreover, when the prospect of an improved demand for patent fuel induced fuel makers to commence buying pitch, the price of the latter went up faster than the price of fuel, with the result that the fuel makers sold ahead, and had to pay ruinous prices for the pitch necessary to make the fuel sold. This was due to holders forcing the price up, and not to the operation of the law of supply and demand.

I trust that this will give you all the information which you require; and, as I previously stated, if you had communicated with me in the first instance, I should have been only too pleased to deal with the points which you enumerated.

If, however, there are any further particulars which will be of assistance to you, will you kindly let me know?

Letter to Mr. Finlay A. Gibson.

By Mr. HERBERT ROBINSON.

[*Feb.* 14.]

I am obliged by your letter of 9th inst., and thank you for suggesting that further information is available. I am thus encouraged to ask more questions.

7.—If of two materials a product is made, does not the price of that product depend more upon the price of the 92 p.ct. material than upon the price of the 8 p.ct., seeing that a rise or fall

of 8d. in the price of the former equalizes a fall or rise of 7s. 8d. in the latter? This, however, does not seem to matter very much.

8.—Have not the gas undertakings, their consumers, ratepayers, and/or shareholders, a right to receive the benefit of market prices for their tar, at least equal to the right of the colliery owners and their workpeople to receive the benefit of market prices for their small coal; and is not the joint ownership of collieries and patent fuel works, in the face of such an agreement as you mention, another indication of the lack of foresight to which I have previously referred?

9.—Are you, or are you not, seeking by the present agitation to transfer the consequences of such an agreement to the shoulders of multitudes of people who are not responsible for them in any way; and, in any event, is not the lack of employment in the patent fuel works to be laid partly at the door of the coal owners and partly at that of the coal miners?

10.—If, as you say, the French patent fuel makers are not working full time, is it not evident that it is not the price of pitch which is hindering them, seeing that they are still bidding against one another, even at the price of to-day; and if the Belgians are working full time while the French are not, does it not seem that the latter may be handicapped, in that they have had to purchase their small coal from you, since both are using English pitch, while the Belgians are using their own small coal?

11.—Is not your reply to my sixth query of my earlier letter an amusing corroboration of my suggestion of extraordinary lack of foresight on the part of the trade for which you write?

12.—Is not your repeated grumble that I did not write to you before addressing a letter to "The Times" (who so far have not seen fit to publish any reply to your diatribe) a grumble that might with very much more force be addressed to the author of that diatribe who must surely, having a bad case, be adopting the precept which enjoins one in that position to abuse the other side? But though an old, it is a discredited way of diverting accusation from oneself to accuse some one else of one's own sin.

I should appreciate any comments you care to make upon the remainder of my letter of 31st ult., which I was led to expect from your remarks when acknowledging receipt of same.

Letter to Mr. Herbert Robinson.

By Mr. FINLAY A. GIBSON.

[*Feb.* 16.]

I received on my return from London your letter of the 14th inst.

While I offered to supply any further information you might desire on any particular point, I do not intend to carry on a series of questions and answers, as I am afraid that the pressure on my time will not allow me to do so.

I think the enclosed letter, which I addressed to the "Western Mail," will deal with many of your questions, and will also, to some extent, form a reply to some of the points in the latter part of your letter of 31st ult.—in fact, the case of the patent fuel manufacturers and the colliery owners is clearly set forth in my communication to the "Western Mail."

[ENCLOSURE.]

Letter to the "Western Mail."

By Mr. FINLAY A. GIBSON.

[*Feb.* 13.]

There are two or three misconceptions in the article of Mr. Emrys Hughes which appears in the Press on Saturday last that ought to be removed. In the first place, he speaks of patent fuel as though it were as much a substitute for coal as, let us say, margarine is for butter—of course, in that sense it is not a substitute at all. Patent fuel is only compressed coal, but as such it is preferable for certain forms of consumption to large or small coal, and the element of substitution comes in only in the relation of its price to that of large coal.

But the fundamental consideration is that patent fuel provides an outlet for certain classes of small coals which would otherwise be unmarketable. If not converted into patent fuel, such smalls would have to be thrown on the bank, which would be a waste of national wealth. Moreover, the storage of small in wagons caused by the reduced demand from patent fuel works would limit the supply of empties for the transport of large. A stoppage of the fuel works would therefore bring about a cessation in the production of large coal. A scarcity of wagons is not an infrequent cause of the stoppage of collieries.

Mr. Emrys Hughes is grievously in error over the question of the payment of wages for small coal. Separately and independently the colliers may not be paid for small coal; but they are paid directly for it in the production of through coal, and indirectly through the production of large coal, for the cutting price of large coal specifically includes all services rendered in the output of small coals. Then, again, the proceeds realized on the scale of small coal are included in the proceeds of the industry as a whole; and under the present agreement wages are regulated by the proceeds of the industry, and wages received 83 p.ct. of the proceeds. It will thus be seen that a good demand for small coal is of benefit to the miners, and a diminished demand a loss to them.

The third point I would like to deal with is the substitution by the local authorities of the asphaltic residue from crude oil distillation and other bitumen resources for coal tar and coal-tar pitch. The position of the patent fuel manufacturers in regard to the consumption of pitch is different from that of the local authorities. In the manufacture of patent fuel, pitch is a necessity. In the case of local authorities it is not a necessity, for there are substitutes available for road construction purposes. If the patent fuel works are unable to obtain pitch in sufficient quantities and at a reasonable price, the works will either close down or enormously reduce their production. The use of bitumen for road construction purposes need not involve the unemployment of a single individual.

That is the essential difference between the two classes of consumers. Last year many thousands of tons of bitumen for road construction purposes were supplied to local authorities. So satisfied are many county surveyors with the results that they have this year doubled the orders they placed last year, and in more than one county bitumen has entirely displaced tar. It is stated that on suitable surfaces bitumen of particular grades will last twice as long as tar. Moreover, it is available in almost unlimited quantities; and the Secretary of the Patent Fuel Manufacturers' Association, Cardiff, will only be too pleased to give information as to where this material can be obtained.

Letter to Mr. Finlay A. Gibson.

By Mr. HERBERT W. ROBINSON.

[*Feb.* 20.]

I am obliged by your letter of 16th inst. and can appreciate the reasons for your not following me further into the rights and wrongs of your case, of which reasons you give at least one. From your continued communications to the Press and your circulars to interested parties, one imagines your time is in your opinion better occupied in *ex parte* statements than in seeking for the truth.

In order to finish off my end of the correspondence, I should like at any rate that you should have the opportunity of considering the following hypothetical cases, and of commenting upon them before I try to get the whole correspondence published, to which publication I take it you will not have any objection.

They are perhaps extreme cases, and I make them as extreme as I can.

Suppose, then, that there had been within the last few years a great war in which we, in alliance with France and other nations, had repulsed an unwarranted attack by Germany and concluded a peace under which the defeated country had to pay reparations. Suppose that France, in order to compel such payment, had been obliged to occupy the coalfields of Germany in order to bring pressure upon that country through shortness of coal, and thus enforce some measure of compliance with treaty obligations.

Suppose that Germany was therefore short of coal.

Suppose that a large English manufacturing town, take Birmingham or Sheffield, were dependent for the carrying on of a trade of national importance upon a price of gas coal to its gas company or corporation gas department of (say) 12s. 6d. per ton, and that it had to purchase that coal from the Monmouthshire and South Wales Coal Owners' Association.

Suppose that Germany bid for the whole output of that coal 25s. per ton.

Would the Monmouthshire and South Wales Coal Owners' Association petition for the imposition of an export duty of 12s. 6d. per ton? Would they seek the prohibition of export? Would they circularize the German buyers asking them please to refrain from buying? Or would they just sell the coal, and let the English trade of national importance look after itself?

Let me try again, and suppose that one of your members owned a tar-works, and let me imagine all the extravagant imaginings of a W. S. Gilbert as to his simultaneous ownership of coal mines producing small coal, coke-ovens producing tar, and patent fuel works using pitch. What would that member do? Would he sell his pitch at a price to suit his other interests, or how would he reconcile his position with the position of his fellow members?

I fear the South Wales patent fuel trade is in a bad way. The causes of this I could make a guess at; but no one needs a more convincing proof of the fact than the present campaign of public and semi-public appeal for absurd restrictions on the freedom of policy of other trades with its entire disregard (1) of the most simple and elementary rules of the decent conduct of business, (2) of the laws of supply and demand, and (3) of the inevitable result of any general compliance with the demands of its hysterical circulars and underground propaganda upon trades like the gas industry—ten thousand times more worthy of consideration and with employees, consumers, and owners ten thousand times more numerous.

Letter to Mr. Herbert W. Robinson.

By Mr. FINLAY A. GIBSON.

[*Feb.* 23.]

I thank you for your letter of the 20th inst., and I certainly claim that my time and my opinion are both peculiarly my own, to be used in whatever way I consider best in the interests of two very important industries—the coal trade being the basic industry of the country.

I am concerned, in common with probably the great majority of industrialists, in an endeavour to seek not only a means for preventing unnecessary unemployment, but for increasing employment and of reviving to the fullest possible extent all our great national industries.

You endeavour to draw me into side issues, and continue to overlook my one and only point—viz., that there are substitutes for pitch available for local authorities; and the use of these substitutes would not cause any unemployment. There are no substitutes for the patent fuel industry, and therefore works must close, with consequent unemployment.

I must politely decline to discuss hypothetical cases, as I am only concerned with actual facts.

You are at perfect liberty to publish the correspondence, provided the whole of it is published, otherwise I shall take the necessary steps to ensure that my facts, which up to the present time have not been publicly denied, are again placed before the public through the Press.

Letter to Mr. Finlay A. Gibson.

By Mr. HERBERT W. ROBINSON.

[*Feb.* 26].

I thank you for your letter of the 23rd inst., and for permission to publish this correspondence so long as I publish it all. I will do my

best; and if any of the jewels are omitted, pray blame the editors and not me. Perhaps you can assist in the publication in your district.

I think we are agreed:

1.—That it is the duty of everyone to diminish unemployment by every practical means.
2.—That the coal trade is a very important industry.
3.—That the gas industry is another important one.
4.—That the roads also are of importance.
5.—That the present interests of all three clash with those of the patent fuel industry, upon whose importance compared with any of the others we take different views.
6.—That the coal owners own the patent fuel works.
7.—That the coal owners produce small coal.
8.—That patent fuel consists roughly of 92 p.ct. of small coal and 8 p.ct. of pitch.
9.—That the price of the 92 p.ct. of small coal has at any rate some effect upon the cost price of patent fuel.
10.—That all this fuss is about the 8 p.ct. of pitch.

I say—and you do not question it—that a high price for pitch means a high price for tar, and, other things being equal, a low price for gas, benefitting 10,000 for every single sufferer, and making it possible for large users of gas to employ thousands for every one of your men who thereby lacks employment.

You call this a side issue; but in comparison with it, what you call the main issue is hardly an issue at all. It is as much of an issue as is a penny in the matter of ten pounds.

You say, on what authority I know not, that imported bitumen is equal to refined tar for making roads. I deny this on the authority of every road surveyor of my acquaintance—and I know many.

Last winter I persuaded a number of tar producers to let me offer your people 20,000 tons of pitch at 50s. per ton delivered patent fuel works in South Wales; and the offer was rejected, in spite of warnings as to what was likely to happen, not because the price was uneconomical, but because, forsooth, we would not agree that any subsequent reduction in the railway rate should be deducted from the price.

To-day your French competitors, buying your small coal, are paying at their works approximately four times this price, in sterling, for the selfsame pitch.

It is they, and not the roads, who are bidding up the price against you, and, as I say, are buying your small coal to help them do it.

You say that they are losing money. I assume that they know their business. At least, they are employing their workmen.

To paraphrase the saying of a wiser man than either of us—I can give you facts, but I cannot give you the wherewithal to understand them.

Letter to Mr. Herbert W. Robinson.

By Mr. Finlay A. Gibson.

I received on my return from London your letter of the 26th inst.

I am sorry I cannot see the necessity for rendering assistance in the publication of the correspondence which has passed between us. I have said I have no objection to your publishing it if you so desire; but I have already given to the Press all my facts, and they have not so far been denied.

Please do not assume that I agree points 4, 5, 6, 7, and 10 in the bald way in which you have put them, because I most certainly do not.

While it is my wish to be courteous at all times to correspondents, and to reply to points submitted to me as a result of my articles in the Press, I cannot see that any advantage will be derived from continuing the correspondence, as we have both fully elucidated our own particular views on the question.

I am, however, obliged to you for having placed before me your version of the matter.

THE IDEAL HOME EXHIBITION.

Gas Well Represented.

There will be no two opinions as to the attractiveness of the Seventh "Daily Mail" Ideal Home Exhibition, which opened at Olympia last Thursday and is continuing until the 24th inst. It is an important show which, during its run, will be visited by great numbers of people on the look-out for suggestions for securing the good appearance, comfort, and efficiency of their homes. To these ends, gas can certainly offer more suggestions than any one other thing; and therefore gas has a right to be not only represented, but well represented. We are happy to say that it is. Just as there can be no two opinions about the attractiveness of the exhibition as a whole, so also there can be but one conclusion with regard to the gas exhibits in particular—they are excellent. Before, however, making special reference to this section of the exhibition, it should be pointed out that the general display is much larger and far more comprehensive than any of its predecessors—this being rendered possible by using the new extensions to Olympia. It is the first time, in fact, that this great building has been employed. By thus taking in all the available space, the Ideal Home Exhibition covers 8 acres of fascinating and very varied demonstrations of everything which makes for domestic progress. Among the sections are the gardens designed by queens and princesses, labour-saving appliances, the latest fashions in furnishing and decoration, food and cookery, twelve full-sized equipped bungalows, wireless wonders and concerts, sports, pastimes, and music, children's welfare, the garden and poultry, products of modern Egyptian craftsmen, and a stocked farm, orchard, and allotment run by members of the Young Farmers' Clubs.

Joint Gas Exhibit.

Without the slightest fear of contradiction by any disinterested person, it may be said that the most brilliant spot in the exhibition is the magnificent stand provided by the eight principal Gas Companies of London. The importance of this joint gas exhibit to the housewives of Great Britain is proved by the fact that it has been given a unique position at the foot of the grand staircase on the ground floor of the main hall. This really fine display has been made by the Brentford Gas Company, represented by Mr. E. R. H. Wingfield; the Commercial Gas Company, represented by Mr. L. F. Tooth; the Croydon Gas Company, represented by Mr. W. J. Sandeman; the Gas Light and Coke Company, represented by Mr. F. W. Goodenough; the South Metropolitan Company, represented by Mr. A. Stokes; the South Suburban Gas Company, represented by Mr. Wilfrid Wastell; the Tottenham District Light, Heat, and Power Company, represented by Mr. A. H. Richardson; and the Wandsworth, Wimbledon, and Epsom District Gas Company, represented by Mr. C. M. Croft. The Hon. Secretary of the Committee is Mr. J. E. Henwood.

In the most interesting and convincing manner, this united endeavour demonstrates how gas can be used economically, conveniently, and with the utmost cleanliness in every home. Included in the display are a model living-room, illuminated and warmed by artistic and efficient apparatus, and a model kitchen with every appliance for gas cooking, water heating, washing, and ironing; while all round, in operation for examination, are suggestions for up-to-date lighting, room warming, and water heating, as well as gas-heated washers and coppers, gas-fired refuse destructors, gas-irons, and coke-boilers. The exhibit affords undeniable proof of the labour-saving and convenient qualities of gas in the home; and there is also demonstrated the value of immediate and continuous day and night service. As regards the illumination of any room, the artistic effect of gas cannot be beaten, no matter how delicate and elegant may be the furniture and general decorations. The incandescent gas-burner in living room, library, and bedroom sheds a soft, glowing light which can be shaded in an infinite variety of ways to tone with the general scheme, while the distance lighter enables one to switch the gas on or off on entering or leaving the room.

On the front, in the main gangway, is an arresting exhibit of the various products which are recovered by the carbonization of coal, and which are lost by the burning of raw coal in open grates. This must give the uninitiated some idea of how great the gain would be if the whole of the 35 million tons of coal used per annum in the British Isles for domestic purposes were converted into gas and supplied to the consumers in this form of fuel. People who have not thought seriously of the matter before, will realize the strength of the case against the old-fashioned coal-fire, on learning that nearly 2½ million tons of soot escape into and pollute the atmosphere every year from domestic fireplaces alone. It is in the displacement of the coal-fire by gas-heating that a remedy for this state of affairs can be found.

The lighting of the stand—mostly on switch control—is, of course, one of its principal features. The standard lighting units of the eight exhibiting Companies are fully represented. There are "Metro," "Brentford," Kempton, Sugg, and "Nico" burners, on artistic fittings by Evered, &c. These fittings harmonize perfectly with the tasteful furniture by Hampton's, and show that modern gas-lighting is able to meet any requirements, no matter how exacting they may be, equally as well as any other system that is to be found. If one might particularize among so much general excellence, it would perhaps be to refer to a five-light chandelier, fitted with "Metro" No. 1 burners and crystal head surrounds—the effect being beautiful. There are also handsome semi-indirect fittings with "Vitreosil" bowls. The heating is by representative designs of "Metro," Main, Cannon, Parkinson, and Radiation fires. There is also a "Garba" gas-heater, which gives out gratifying warmth at a cost of a farthing an hour. "Metro" automatic lighters are in evidence. They are handy for lighting cigars and the burners on cookers. By their use, matches and litter are avoided; and they are just one of the little conveniences for which people are always on the look-out.

For the bathroom, as far as possible a choice of methods is shown, so as to meet a variety of conditions. There is a bath supplied with hot water from a circulating boiler, and, as an alternative, where there are no existing hot-water pipes, a Parkinson "New Treasure" geyser is fitted. Another bathroom is supplied from a circulator, and also from a Ewart "Lightning" geyser. With this geyser, small flames are first lighted, and then the operation of turning on the water works a dual valve, and increases the supply of gas. When the water is turned off, one cannot get more gas than is required for the small flames, which would be insufficient to damage the geyser.

The culinary equipment is of a very complete character. In an all-gas kitchen, there is a "Westminster" cooker, with Larkin hotplate, and a Potterton No. 921 "Victor" circulator complete

set, with rectangular storage, suitable for small spaces, being only 12 in. wide. There are also a Davis gas-fired refuse destructor and a Wilson fire. Another all-gas kitchen represents the old-fashioned range removed and the existing hot-water installation connected-up to a Potterton No. 92 circulating boiler—the hot-water storage tank being in the linen cupboard adjoining. A "Metro" No. 2 cooker and a "Metro" No. 40 fire complete the recess. This particular fire gives nine hours' heating for a therm. A gas wash-copper and a sink with hot and cold water laid on complete this section. A third all-gas kitchen has had the existing range taken out and replaced by a "Regulus" No. III. cooker. Here the hot-water system has been modernized, by the installation of a Wright's "B.T.U." circulator, complete with storage tank, cut-out valve, and thermostatic control. This portion of the exhibit includes, in addition to those already mentioned, Main, Parkinson, and Richmond cookers, and Edgar geysers. "Sentry" and "Glowworm" coke-boilers are on view. Great interest is taken in the work of lady demonstrators with Davis, Keith, and "Metro" gas-irons. With gas at 9d. per therm, they can iron for four hours for a penny.

All-Gas Bungalows.

The "Daily Mail," as usual, are doing their best to educate the public with regard to new building methods; and a feature of the exhibition on this occasion is Bungalow Town. Scale models are also shown of the three prize-winning designs in connection with the "Daily Mail" labour-saving bungalow £500 competition for architects. It is noted that a design by Messrs. Hennell and James reveals a full appreciation of the possibilities of gas. In Bungalow Town a number of small buildings have been erected, and are creating widespread interest. It seems, however, that in only one instance are these bungalows completely equipped and, if one may say so, in full working order. This "live" example is a pair of semi-bungalow cottages, of which the Architect is Mr. George E. Clare, M.S.A.; the contractors who have erected the cottages, and specialize in this particular construction, being Messrs. J. & W. Stewart. The buildings are of two types, one to accommodate five persons, and the other six. They are built in sections bolted together so that the whole framework can be erected in a few hours; and the filling is by means of patent "Interloc" brick cavity blocks.

Many, however, as may be the other advantages of these cottages, to "JOURNAL" readers the special point about them is that they are "all gas." They appear, indeed, to be the only houses in Olympia that are maintaining the position of gas for lighting, which is carried out by means of "Metro" burners. They are also efficiently heated by "Metro" fires, the silent burning and good heating qualities of which are demonstrated.

The South Metropolitan Gas Company had the equipping of these cottages with gas, and having arranged the lighting and heating in their usual thorough manner, they handed over the cooking and water-heating part of the work to the Parkinson Stove Company, Ltd. To step into the kitchens of these model cottages is to realize that the woman's point of view has been appropriately recognized. The equipment constitutes a direct appeal to the housewife, and the selection of gas-consuming appliances, shown in operation, demonstrates that the value of the feminine influence in the choice of a home has been gauged to a nicety. Parkinson's "Suburbia" gas-cooker, fitted with high-efficiency hotplate, with plate rack and enamel back, and raised from the floor on a cast-iron stand, with white enamel top, is in use in both kitchens. Hot water for the bath is provided by Parkinson's Maughan geyser (No. 92 "Treasure," capacity 2½ gallons per minute); while its consort—the "Gacylette," No. 323, of 3 gallons capacity—supplies high-temperature water for sink and other domestic purposes in the smaller house. In the other house, hot-water facilities are provided by means of Parkinson's "New Cottage" all-copper water heater, of a capacity of 13 gallons. The housewife discovers how she may obtain nearly-boiling water for washing-up, scrubbing, &c., in a few minutes, and a hot bath in 30 to 40 minutes at an extremely low cost for fuel. This compact water heater has enjoyed phenomenal demand. In London alone some 4000 have been installed in new houses—2500 of which are in daily use on the London County Council's estate at Becontree. The latest type of washing coppers are also shown.

(To be continued.)

Midland Association President.—In the last issue of the "JOURNAL," it was stated that at the meeting this week of the Midland Association of Gas Engineers and Managers Mr. W. H. Adams, of Bilston, would deliver his Presidential Address. This was a mistake. Mr. Adams is the retiring President; and the new President, Mr. P. N. Langford, of Coventry, will be inducted, and will give his Inaugural Address.

Institution of Petroleum Technologists.—The tenth annual general meeting of the Institution will be held at the Royal Society of Arts, on Tuesday, March 13, at 5.30 p.m., and will be followed at about 6 p.m. by a Presidential Address by Prof. J. S. S. Brame, F.I.C., F.C.S., the retiring President. The President-Elect for the ensuing session is Mr. Herbert Barringer, M.Inst.C.E., M.Inst.Mech.E., M.I.N.A.; and the Vice-Presidents are Mr. Alfred C. Adams, Sir George Beilby, Sir John Cargill, Viscount Cowdray of Cowdray, Mr. Arthur W. Eastlake, and Sir Thomas H. Holland.

POWER PRODUCTION IN RELATION TO ULTIMATE VALUES.

The following are extracts from a paper on the above subject given by Mr. A. Hugh Seabrook, M.I.E.E., on Feb. 26, 1923, at a meeting of the Bradford Engineering Society.

The main consideration in power production is economy, but what I want to emphasize is that the real economy—which is the ultimate economy—may require an apparent lack of economy at the point of power production. I do not wish to belittle the excellent work that is being done by power-plant economy specialists; but I do want to give a word of warning—that zeal for power-production economy must not lead to extravagance so far as the ultimate results are concerned.

Power production is only one link in a long chain of operations, whether the end of the chain—the finished article—be the production of coal, steel, soap, water, gas, electricity, or any other marketable commodity. I will just deal briefly with the position of power production as I see it to-day, and will enlarge on what I mean by the apparently cryptic title chosen for this lecture.

One cannot help noticing that the super-power station is becoming much less popular among power-production engineers than it was a year or two ago. The prospect of enormous power stations containing 50,000 KW. sets, is, at first sight, a most attractive one. To-day, however, I think that engineers are settling-down to the idea of what may be called medium-sized stations, linked up where possible, rather than of a few enormous stations giving a "cheap and abundant" supply of electricity throughout the country, of which we have all heard so much since about the year 1919, but of which we have not seen much to date. The fact of the matter is that the huge electric power station could not like the huge gas-works or huge water-works provide its consumers with its product at any lower cost, and in many cases at not so low a cost as it can be provided by smaller undertakings. At the same time there are conditions where the very large station is undoubtedly the right type to adopt—as, for example, where there is a very big source of hydro-electric power. In such case the source of power is necessarily concentrated, and is far more than sufficient for the comparatively small surrounding area. It seems justifiable, therefore, to put up a generating station which will make use of as much of the energy as can be harnessed, having regard only to the distance the power has to be transmitted, and its cost at that distance compared with the cost of power produced locally from any other source—coal, oil, &c.

Another condition favouring the erection of a very large power station is where large deposits of inferior fuel, such as brown coal, lignite, and perhaps peat are available. Generally such material can be turned into electrical energy cheaply owing to the low cost per ton delivered into the boiler house. This is particularly the case when preliminary treatment of fuel will extract from it bye-products, leaving a coke residue to be fired into the boilers for steam-raising purposes. The limits of such a generating station appear to me the same as the limits to the size of the hydro-electric station—*i.e.*, if the deposit of the fuel is the only one within a radius of, say, a hundred miles, it would probably pay to transmit electrical energy generated from that deposit to that distance; but if there were another deposit (say) fifty miles off, it is most likely that medium-sized power stations erected at both points would be the proper course to take, and we might thus have several medium-sized stations instead of one very large one.

It seems to me that this is the position that more or less applies in this country. Our coal, which is practically our only source of power, is distributed nearly all over the country, and for this reason I cannot see any justification for a few very large stations as against a larger number of smaller ones linked up to each other wherever possible. There are many factors that emerge as being of great importance in connection with the operation of large power stations, which tend to some extent to discount the importance of the low cost of power production. For instance, big lengths of mains, besides being costly, even if they can be maintained overhead, are necessarily much more complicated and more difficult to control than shorter lines. Further, there is the appalling cost and complication of the switchgear of such a station. It seems to cost more than the electrical plant it has to control; and the space it requires, and the care in operation and the maintenance needed, seem to be excessive.

We must keep in mind that the value of the product of the big power station has to be expressed in terms of the cost of the energy that it can deliver at the most distant consumer's terminals. There is not much doubt that this has been partially overlooked in the race for power-station economy. The cost of power produced at these large stations must be extremely low for them to justify their existence, as the additional cost of distribution, even only ten miles away from the station, may raise the cost of energy to the consumer beyond that at which he can provide for himself by means of a small and efficient plant worked either by steam or by internal combustion engines. A very large steam power station suffers from the drawback that it is too large to utilize the most economical power plant. The smaller turbine has a better thermal efficiency than the very big one; and the small internal combustion engine has a very much better thermal efficiency than any steam plant. In this connection we must not overlook the fact that side by side with the development of the

large electric generating station proceeds the improvement in the internal combustion and the small steam engine. Great attention is being devoted to simplification and reliability, with a view to reducing the cost of attendance and repairs. In the case of small stations this is a more important desideratum than a low fuel consumption, and complete electric power stations are now being erected that will run practically without attendance.

Can anyone estimate the amount that should be set aside for obsolescence and antiquation in the case of a large power station with a capacity of (say) 200,000 KW. and a capital cost of £4,000,000? The uncertain factor is mainly the possible improvement in boiler and turbine practice and in the self-contained power unit, such as the internal combustion engine or even the small steam power plant with highly superheated steam. The ultimate value of an undertaking comprising a very large power station and big transmission system, is the dividends it can earn on its ordinary share capital after providing for depreciation, antiquation, and obsolescence. First of all, the price per unit supplied to the customer must be a competitive one, able not only to compete with the cost of production of the isolated plant, but also leaving a margin for possible reduction in price as the isolated plant decreases in cost and improves in efficiency. Thus the fundamental price per unit must carry in it a figure for depreciation, obsolescence and antiquation, which should be a very substantial one because not only may a radical improvement in design of internal combustion or other type of engine necessitate reduction of the competitive price, but the possibility of a revolutionary improvement in big station practice, calling for scrapping of exceedingly costly plant long before it is worn out, must not be ignored. The percentage of the price charged per unit which represents power production cost is very small indeed when compared with all these other costs, interest, depreciation, and (particularly in the case of very large systems) loss in transmission and distribution.

There is another somewhat similar case in connection with power-plant work which was brought to my attention quite recently. We are putting down a number of small electric generating stations for public supply in conjunction with gas-works, and so far invariably advise town gas as fuel. I have been asked, Why use town gas at double the price per therm at which a fuel oil can be obtained? The answer is that the fuel cost may have very little to do with the cost of production. In these cases it is not the fuel but the fuel *plus* labour *plus* repairs; and we can cut down labour by employing gas-engines as compared with oil-engines, and also cut down repairs; so that the cost represented by the sum of these items in the case of town-gas engines erected at a gas-works is much less than it is in the case of oil-engines. In some of these cases the cost of an extra man for attendance may equal half the cost of the fuel bill.

We are building larger stations and systems on the assumption that concentration of power plants and long transmission lines are permanently correct practice. I am not sure about it, and am far from being convinced that it is going to be of lasting superiority over decentralization of power. I fear that, consolidated and backed up by Acts of Parliament, the centralized system of power production and supply may become so entrenched that even when proved to be obsolete it will be difficult to supplant the system, in spite of the fact that its scrapping may be to the interests of the community. Those who press on the present policy are to a great extent blind to improvements that are even now possible in small plants. They compare what a large steam station erected to-day can do against a small steam station erected (say) 20 years ago, obviously and quite correctly to the advantage of the large one; but they do not compare a small modern oil or gas station with a large modern steam plant.

I can assure you that taking all things into account there is nothing in it to the advantage of the large station except in those cases where there is a large demand for electricity within a short radius of the station. I do not want anyone to think that I am decrying in any way the importance of economy of fuel or of any other factor in the cost of power production. What I want to press home with all the emphasis in my power is that in all our efforts at economy it is essential that all circumstances be taken into account; otherwise what is apparently economy may actually be extravagance—"penny wise and pound foolish."

"B.C.G.A." Midland District Conference.—Next Wednesday (March 14) there is to be a Midland District Conference of the British Commercial Gas Association, at Gloucester, under the Presidency of Mr. J. H. Jones, J.P., the Chairman of the Gloucester Gas Light Company. The proceedings in the City Council Chamber will comprise a morning and an afternoon session. The Mayor's welcome will be followed by an opening address by the President, to which Mr. W. M. Mason (the Manager of the Association) will reply. A discussion on developing local sales will be opened by the Secretary of the Association (Mr. J. C. Walker). After luncheon at the Bell Hotel, there will be a public conference for the discussion of two important subjects. "Atmospheric Pollution in Relation to Health" will be introduced by Dr. J. R, Bibby, Medical Officer of Health at Gloucester; and the "Contribution of the Gas Industry towards Reducing Atmospheric Pollution," by Mr. James Paterson, M.A., Engineer and General Manager to the Cheltenham Gas Company. In the evening Dr. C. W. Saleeby, F.R.S., Edin., will lecture in the Shire Hall on "Life and Light."

CONSUMERS' COMPLAINTS AND INQUIRIES.

By W. H. Sainsbury, Secretary to the Truro Gas Company.

[Abstract of a Paper presented to the Cornish Association of Gas Managers.]

For the past twenty years I have been brought into close touch with the consumers, and this experience has led me to realize and to advocate the advisability of giving due consideration to the consumer's point of view. In reading the account of the district meeting of the British Commercial Gas Association held last autumn in Bristol, I was glad that prominence was given to the need of winning and retaining the confidence of our customers and the public generally. At the outset, let me state that the scheme which was brought to our notice at our last meeting—viz., for the training of gas engineers and apprentices—is one which I hold to be of vital importance to the gas industry if we are to retain and increase our business in the future. The importance of this training was emphasized at a meeting of gas salesmen which I attended at Exeter in November last, as was also the need of demonstrations and lectures on topical subjects connected with the distribution of gas, and the manifold purposes for which gas is applied. A resolution was carried at this meeting approving the formation of a "Gas Salesmen's Circle" for the South Western area, with Plymouth as a centre for this district. The scheme, however, has evidently not yet materialized, and owing to the serious loss of time involved in attending meetings at such a distance, as well as the question of the expense incurred, I do not see that such a circle can be of benefit to many on the staffs of the Cornish gas undertakings. I do, however, suggest that a course of lectures could be arranged to be delivered by various members of this Association, or other recognized authority, to be held at suitable centres in Cornwall, for the purpose of bringing to the notice of our outside staffs the latest developments in the use of gas, and to deal with the problem of lighting upon scientific lines.

In the smaller gas undertakings especially, it is the fitter who comes intimately in contact with our customers, and it is essential that our representatives should be not only good craftsmen, but also capable of tendering sound advice when required, and able to discuss intelligently the relative value of the commodity which we sell, compared with that offered by our competitors. Emphasis should be placed upon the manner in which consumers' complaints are received and recorded. I am aware that in many cases the intimations received are vague in character, and that cross-examination on the part of the person to whom the complaint is given fails to elicit any definite particulars as to the nature of the trouble. But there are cases, especially where the receiving office is separate from the works, when important details are given by the customer, which, if duly recorded, would be of great service to the employee sent to attend to the complaint. Except, perhaps, in the smaller works (where every detail comes under the notice of the manager), it is desirable that the "Complaints Sheet" should be periodically scrutinized and tabulated. In this way, recurring complaints would be quickly brought to the notice of the engineer.

Complaints of insufficient or inefficient lighting, dirty fittings and ceilings, are problems which require careful and skilled attention in order to provide a satisfactory remedy. Many of these complaints, of course, are found upon examination to be due to defective fittings, faulty burners and mantles, and especially dirty globes; but unsuitable arrangement of the light and the choice of the wrong type of fittings or burner are also causes of dissatisfaction. A system of burner inspection and maintenance is apparently the only practicable remedy for insuring that burners and glassware are kept reasonably clean and in working order; but the system is costly if extended to all consumers without a charge; and care needs to be exercised in obtaining the right type of employee to carry out this class of work, as the duties tend to become monotonous, with resultant slackness, unless the work is well supervised. Further, in this respect it is particularly needful, if we are to give the "good service" which the Chairman of the Executive of the British Commercial Gas Association so eloquently sets forth in the last "Bulletin," that the inspection should be backed by the works staff, and the gas supplied should, as far as possible, reach the ideal standard of constant pressure and uniform composition.

With regard to variation of pressure, I think consideration should again be given to the use of the service governor; but I would suggest that it be applied only to the supply for lighting purposes. Higher pressures are now more general than when the inverted incandescent burner first came into prominence, and, provided the pressure in the service at the inlet of the governor (which would be placed on the outlet of the meter, after provision had been made for running a supply pipe for other purposes) was above 25-10ths, a suitable even pressure at the burners could be maintained. Under such conditions, the work of the burner maintenance inspector would be materially lessened, and the usefulness of his visits increased, as the conditions under which the work of adjusting the burners is now carried out (with pressure often varying considerably in intensity during the hours of lighting) makes the question of adjustment purely one of judgment, which is ofttimes faulty. The increase in the number of inquiries for advice as to the most suitable method or system of lighting to be adopted in lighting new premises or bringing old installations

up to date, brings into prominence the necessity for giving instruction to our staffs on the laws and rules of illumination, and of supplementing this by practical demonstration.

The reprint of Mr. Sandeman's paper given at a meeting of the Illuminating Engineering Society, published by the British Commercial Gas Association, contains much useful information, and sets forth some simple rules for calculating the candle power and number of lights required for lighting various types of building.

During the last two or three years many new types of burner have been placed on the market; and the efficiency per cubic foot consumed has been greatly increased. It is therefore imperative that the wide range of fittings now obtainable should be brought prominently to the notice of our staffs, so that our customers can be wisely advised. In these days of keen competition with electricity, the importance of good window lighting cannot be too strongly emphasized, and consideration should be given to the nature and colour of the goods generally exhibited. Domestic lighting also requires more attention than formerly. Complaints of insufficient light for working at night, especially when working on dark materials, are often made. The use of the semi-indirect method of lighting, while useful for reception rooms (giving a soft light free from strong shadows) is open to the objection so pithily expressed by one writer, that in a room so lighted "there is no place where you can thread a needle." One great advantage with burners of this type is the ease and comfort with which adjustments (either of the gas or air supplies) can be made, even when the burner has been alight for some hours. The burners also keep clean, and the fittings are not so quickly tarnished. These are important points, and though they may be regarded as minor complaints, yet the task of adjusting a burner of the ordinary inverted type when it is alight is sometimes painful. This difficulty, together with the discoloration and tarnishing of the fittings, often turns the scale in favour of our electrical competitors.

Complaints of glare and eye-strain and excessive heat, principally in the case of "desk lighting," present a problem which is not easy to solve. The use of silica globes has an appreciable effect in reducing this defect, but the unit of light should be kept as low as is consistent with good lighting, in order to reduce the amount of heat radiated from the burner. Complaints as regards the effectiveness or design of gas-fires are not so prevalent now as fifteen or twenty years ago, and a customer must be hard to please who cannot select a fire suitable for the most ornately decorated room or apartment. But great care must be exercised, particularly in districts like Cornwall where the price of gas is necessarily high, to ascertain from prospective customers the purpose for which the fire is to be used, and to warn them of the cost if the fire is likely to be used for continuous heating.

I think it is a subject for discussion as to whether some of the modern gas-fires are not excessively ventilated. Admitting that heating by radiant heat is the most natural and comfortable method, I fail to see the necessity of making the fire act as an ejector of the air in the room, for unless care is exercised in providing suitable fresh-air inlets, the result is that a seat by the fire is the most draughty place in the room, and the general warmth from the incandescent radiants is accompanied by a strong feeling of discomfort by the air drawn in from window and door owing to the accelerated "pull" of the chimney flue. Many modern coal-fires are arranged to be fed with fresh air drawn from the outside, and admitted close to the hearth, which I consider is worthy of imitation in the case of gas-fires. The ventilation of a room should be effected at or near the ceiling. I should like to say a word or two with reference to the recommending or the fixing of gas-stoves of the flueless type. Undoubtedly there is a demand for this class of stove, and while it may not be wise to push their sale for general use in an office or living room, yet I think they should not be altogether discouraged. It is certainly inadvisable, while we supply gas containing objectionable sulphur compounds, to instal a flueless stove without warning the user that we cannot guarantee them to be non-odourless. Complaints as to excessive cost of gas for cooking and other domestic purposes are, unfortunately, not unknown. In many cases this defect can partly be traced to inefficiency on the part of the cook, and failure to comprehend the principles underlying the right use of a gas fuel, which, if used wisely, is a fuel saver.

But this explanation does not altogether get rid of the complaints. In Cornwall, as I mentioned before, the price of gas is necessarily high, and with the reductions taking place in the price of petroleum, it is necessary for us to give the question of relative costs careful consideration. The need for providing more efficient cookers has been, and still is, under the consideration of the National Gas Council; but I should like to emphasize the importance of giving attention to the cookers now out on hire, with a view to the hotplate at any rate being remodelled, so as to enable a greater efficiency to be obtained. When considering in November last the collection of suitable material for this paper, I carried out a little experiment at home on my own cooker—a No. 100 Richmond—using the large burner and an aluminium kettle of 3½ pt. capacity, weighing 12 ozs. The time taken to raise one quart (2¼ lbs.) to boiling point was 9 mins. 30 secs., and the quantity of gas consumed 3·55 c.ft. Assuming the gas consumed to have been of the declared calorific value (450 B.Th.U.), I found, after making allowance for the heat absorbed by the kettle itself, that the efficiency worked-out at only 27·3 p.ct., a result which compares fairly closely with those published by the Standardization Committee on Gas Cookers, in their report to the National Gas Council.

In the second test, with the heavy grid removed and the kettle suspended at the level of the hotplate from the handle, the time taken to raise a similar quantity of water was only 6 mins. 45 secs., and the quantity of gas consumed was brought down to 2·2 c.ft., giving an efficiency of 44 p.ct. To scrap these cookers and purchase stoves of a more modern and efficient type would in this case cause financial embarrassment to the gas undertaking, and not the consumer. But I do think that the question of remodelling the hotplate should receive our attention. The National Gas Council have, I find, been making investigations on these lines, and you will find on the table a copy of a report by Prof. Barker on the result of a test made by him on an "Eureka" cooker, made about 1898, and recently remodelled on the lines set forth in the specification issued. The increased efficiency is most striking, the increases ranging from 30 to 185 p.ct., the efficiency of the boiling-burners being raised from 17 to 48·5 p.ct. Assistance might be given to the National Gas Council in their endeavours to obtain reasonable prices for these alterations, if a census of the number of old cookers, tabulated according to makers and sizes, was taken, and an estimate made of the probable number of stoves which the gas undertakings would have remodelled.

Mr. Sainsbury was heartily thanked for his paper, on the proposition of the President (Mr. William Nicholls, of Penzance).

BRITISH COMMERCIAL GAS ASSOCIATION.

Scottish District Conference at Dundee.

SMOKE POLLUTION—A PLEA FOR LEGISLATION.

Under the auspices of the British Commercial Gas Association, a most successful public conference, open to delegates from the Scottish burghal and county districts, was held in Dundee last Friday. There was a large attendance of gas managers from the North and East of Scotland; while it was also noticed that municipal and county governing authorities were numerously represented. Proceedings opened in the forenoon with a civic welcome from the Lord Provost and members of the Corporation.

Lord Provost ALEXANDER SPENCE, O.B.E., said a good many people thought some fifteen or twenty years ago that, with the development of electricity, the gas industry was bound to recede into the background. This had not been their experience in Dundee, where, as electricity went forward, so also did the gas undertaking. In Dundee not only had the consumption of gas increased, but, as a matter of fact, it had quadrupled during the past fifteen years. Of course, he quite conceded that in Dundee they were somewhat fortunate in having as Manager a gentleman like Mr. Alexander Yuill, who was not unfairly regarded as being "at the top of the tree" in his profession. It had been largely due to the initiative, energy, and enterprise of Mr. Yuill that the gas-works in Dundee were as well equipped and as up-to-date as any other undertaking of a similar nature in Scotland.

Councillor JAMES S. BROWN (Convener of the Dundee Gas Committee) thereafter took the chair, and declared the conference open. He intimated that representatives from Glasgow and Edinburgh had been unable to attend, owing to previous engagements. He thought the crusade which the "B.C.G.A." had started among the young people of the country was specially to be commended; and the booklets which were sent out to teachers appeared to have found general favour. As a matter of fact, he had before him at the moment letters from two teachers expressing admiration for the attractive way in which the books were got up, and wondering if it was not possible to have a series of lantern slides for day-school purposes, so as to develop further interest among the rising generation in the uses of gas. He was a believer in the policy of demonstrating to the public the fullest value of any commodity marketed. Despite the competition from electricity, the future of gas would be a bright one. All the data available in Dundee showed that there was ample room for the development of both gas and electricity in that city. At the moment they had under construction in Dundee a holder that would enable them to meet the future demands of consumers.

THE ASSOCIATION'S WORK.

Mr. W. M. MASON (the Manager of the "B.C.G.A.") followed with an interesting statement explanatory of the scope and functions of the Association.

THE DUTY TO THE PUBLIC OF GAS SUPPLY UNDERTAKINGS.

By J. W. Napier, Alloa.

Mr. Napier then read a paper on this subject. In the early part, he said he would like to see the British Commercial Gas Association pursue a different direction of publicity, and this was in constantly enlightening the domestic and industrial public as to the scientific and economic value of the industry—that to use gas was scientifically and economically the proper thing to do. He felt assured that this knowledge would impress public opinion, and put gas on a higher standard of respect and appreciation. He then went on as follows.

Progress of Gas Supply in Scotland.

If evidence is required to show that the use of gas has made an enormous advance, there is conclusive proof to be found in statistics applicable to Scotland alone. In the year 1902, 13,841 million c.ft. of gas was manufactured. In ten years this had increased to 17,301 millions, and in another ten years to 23,514 millions. The total increase in the output of gas in Scotland alone over a period of twenty years is fully 70 p.ct., and this during a period when electricity, for example, has forced its way into public favour in its own particular domain. It is interesting further to know that in 1902 the number of domestic cooking appliances in use in Scotland, as given in a statistical table of returns, was almost 52,000, and that in 1922 this number had increased to 567,000, or very nearly eleven times greater. In addition, there has been the enormous increase—and it is not possible to give figures—in gas-fires and appliances for the use of gas for many different purposes. Evidence of this kind of such recent growth is surely convincing, especially when it is recollected that the business of selling gas is now at its centenary.

Gas Rates to Consumers.

The element of cost to the consumer undoubtedly determines the amount of his purchase of the article provided. One of the basic needs of the present day is a cheap gas supply for domestic use and industrial requirements. Economy in living, and low costs of industrial production, have become the crucial demands of the hour. The price of gas to the consumer is determined by two important factors. First, the costs of manufacture and distribution; secondly, the quantity of gas consumed by the population of the area under supply, relative to capital expenditure of the gas undertaking. The undertaking with the large output of gas, having a high consumption of gas per consumer, will be found, on examination by comparison of statistics, to be selling gas at low rates. Conversely, the undertaking with a high price of gas is found to experience a relatively small use of gas in its area of supply. Practical illustration of these statements could be given by cited cases. To present one instance, with a population fully double, but with a somewhat high price of gas, the sales are one-third less in amount than in the case where the population is less by one-half, but where gas rates have been constantly low over a period of years. There is no need to emphasize the importance of price, but it is instructive to be reminded of its influence.

It has been stated that price is largely regulated by costs of manufacture and distribution. Alongside of the practical aspect there is also the capital account of the undertaking. Efficient manufacturing plant and wise capital expenditure in gas-producing apparatus have a first place importance; but this is a side of the subject that is not pertinent to the proceedings of this conference. Let us examine instead the inter-relation of service of gas between supplier and consumer. Briefly stated, the following are my views as to the incidence of gas charges. There ought to be no such practice as having one flat rate of charge for all classes of consumers. Experience has proved this, and almost every gas undertaking in the country provides a scale of charges for the different standards of gas consumption based upon quantity used and period of demand. It is desired, however, to direct closer consideration to differential rates and discounts. The value of a consumer is in direct proportion to the quantity of gas used if the consumption is a day load and a long-hour demand. In other words, the very large consumer is entitled to wholesale rates, and these are already provided by gas suppliers in many instances. Where works plant and main pipes are laid down, and the capital is already spent, then additional output of gas in large quantities to single consumers where no fresh expenditure is required should be provided at a large reduction. If the price of gas is to decide its use and give it the preference where there are other competitors for the supply of heat energy, then low rates should be offered. Managers of gas-works know how cheaply gas can be made at the cost of coal and wages, with credit value of residuals. Bearing in mind bare works costs to produce one thousand cubic feet of gas, and the large income to be derived from the single large consumer, and the absence of fresh capital outlay of any moment, it may appeal to officials to re-cast the differential rates of charge in force. There would be no unfair advantage to consumers of small quantities of gas at a higher rate of charge, as clearly the effect of considerable use of gas by the big consumer would be to reduce the general rate. Instances can be given of rates to large consumers (the term "large consumers" must be interpreted according to the size of the particular undertaking) where the charge is 30 p.ct., 40 p.ct., and even approaching 50 p.ct., below the price of gas to the ordinary consumer. The conditions of supply demanding such low rates refer only to a day demand throughout the whole year, and have no significance in cases where gas is used for lighting for the short winter period.

To one feature of the price of gas it is desired to direct your special attention. In my opinion, an inclusive rate should be decided upon. What is meant by an inclusive rate is that the price charged to the consumer for gas should include the use of meter and cooker. Time and experience with not a few gas undertakings in Scotland have amply proved the wisdom of this policy. It would be considered retrograde to depart from it. The evidences are substantial, and indeed are based on sound principle. The view that an inclusive charge is incorrect and is not just to the consumer has considerable advocacy with metropolitan and many provincial undertakings in England. It is stated, and with apparent truth, that as the price per 1000 c.ft. must include the cost of meter and cooker, the more gas consumed, the larger would be the meter and cooker rental to be paid for. This is literally true, but I have no sympathy with the view taken as a sound business policy. The manufacturer who sends his goods over the railways does not impose a separate charge for transport. The retailer of the same goods in delivering them to the customer's house does not charge extra to cover cost of delivery. The use of a meter is not singular to a certain class of consumer, but is common to all consumers. The meter is required in the same way as are main and service pipes. It is part of the necessary equipment of an undertaking in the distribution and sale of gas. The law of averages—*i.e.*, consumption divided by costs to produce and sell—determines what is the expense to the gas department, and what is the charge to the consumer. Meters and cookers are of universal use, and necessary for the sale of gas. A separate charge is irritating to the consumer. However views may differ, it has been proved in Scottish practice that the policy of an inclusive price has been abundantly proved by the greatly increased number of cookers put into use, and the increased average consumption per consumer. The aggregate increased amount of gas used is the influence in reducing costs, and becomes the factor in enabling the undertaking to sell more gas.

Supply of Appliances.

In the providing of gas-consuming apparatus for domestic use, there is a distinct difference of practice by gas-supply authorities. The different arrangements provide for free supply, hire purchase, or simple hire. Some qualification is necessary in considering the best policy to follow. To take, in the first place, appliances for cooking, my own experience during the past 17 years, corroborated by the experience of many others, is that as regards cooking apparatus for domestic requirements, the cost should be entirely borne by the department, thereby giving the use of the apparatus entirely free to the consumer. In this regard what is the cost to the department, and what are the results that follow, and what benefits accrue to the domestic households of the country? Coincident with this subject there must be kept in mind the broad elevating task of promoting public health and giving a purer atmosphere. I prefer to abide by my own experience. As regards cost of fixing, it is the generally accepted practice in Scotland that this work should be done free of cost to the consumer. With a meter already provided, it is equal to taking-on another consumer. In this matter no limit should be placed on the length of pipe laid, as the average cost to all consumers is the proper data to take. Any limiting practice in free fixing has not been found satisfactory, or indeed practicable, in actual experience. As to supply of apparatus without rental, the author is free to state that after many years' experience it would be found next to impossible to attempt reimposing a rent. Taking the cost of pre-war cookers, rentals would have yielded slightly over one penny per 1000 c.ft. on the consumption of the consumer. The figure to-day with the higher cost of cookers would be three to four pence; and less if the rentals charged were reasonably low. If results of experience are examined, it will be found that those undertakings supplying free cookers have by far the largest number of cookers in use, have progressed the most in gas output for domestic use, and have thereby increased the individual household demand for gas. It is our duty to take every possible means to make gas a necessity, and to give every facility possible consistent with equity to the various classes of gas consumers. To confer a lower charge for gas upon the consumer having a cooker would mean a second meter; and this is quite out of the question, as the providing of a second meter would entail further capital outlay.

In considering the duty of the undertaking to supply the consumer with heating appliances—viz., fires, radiators, water-heaters, &c.—there is not the same clear line of policy as in the case of cookers. The variety of fires, for example, the difficulty of satisfactorily meeting the varied requirements of consumers according to circumstances, and, in short, the absence of standardization, make it almost impossible to consider free supply. The author has followed the practice of fixing free and selling outright at a small percentage above cost. It is admitted that this arrangement has limited the output, and that simple hire or hire purchase would stimulate business and yield increased demand for heating apparatus. The system of direct sales commends itself as thereby tending to permanent use and continued consumption of gas, and avoids the return of appliances. Hiring-out of appliances is necessary in order to increase gas consumption. With appliances of this type, the demand for gas is more seasonal compared with the use of gas for cooking. Climatic conditions alter very seriously the value to the gas department, and the extent of sales of gas. It will be noted that the load factor of this type of appliance is

not so helpful to the economic production of gas, as the demand is short, and generally at the time of maximum output. The rates to be fixed for hire should include interest, depreciation and average cost of replacements. The fixing should be done free, no charge to be included in the hire rate. It must ever be kept in view that the use of appliances with terms and conditions that are attractive, will all tend to make for their permanent use, while the aggregate increased consumption of gas will be considerable. It is also to be observed that there is no reduced rate for gas, that the meter and service-pipe already provided are yielding an increased revenue, and that the output of gas, which is the one all-important factor, is adding to the profit on capital already spent. Standardization of gas appliances, limiting size and type, will be a great gain to the industry. At the present time there are a large number of makers of appliances, each with their own variety of design, all of which does not tend to economy of purchase. Gas undertakings supplying apparatus on the hire system are well advised to adhere to only a few designs. In the matter of standardization, there is much to be accomplished, and the National Gas Council have this matter intimately before them.

SERVICE TO THE PUBLIC.

I have already endeavoured to press upon your notice the importance of cheap gas. Along with the advantage of price, the public must be made to feel the need for the use of gas. Price is all important, but good efficient service must also be provided. It therefore follows that the gas supplier should have a commercial department to act as the force in providing the proper service to consumers. In the public services of a community, gas is different from all others, inasmuch as there is so much more variety of use. Economy is essential, and technical knowledge must be constantly applied. Let us consider lighting by gas. It is now felt that supervision of consumers' lighting burners is a proper duty to be undertaken by the gas authority. How many undertakings in Scotland perform this duty completely? The need is felt for this; and I am not aware of any objection to this work being carried out direct by every municipal and company undertaking in the country. It is surely not carrying-out our promise of efficiency in the use of gas if we do not take the necessary measures to make certain that the consumer is obtaining satisfactory lighting value. A simple scheme of supervision and maintenance can be performed at small cost to the undertaking, the consumer, of course, paying for all supplies. It is one of the curious anomalies that service should stop at the outside of dwellings. It is not overlooked that there are many gas undertakings performing this work, but I do seriously suggest that this supervision should be put into practice by every gas undertaking in the country. Glasgow has now a scheme in practice, and this on a large scale, doubtless because it has been recognized as necessary in the interests of consumer and gas department alike. In this regard, it will be of value to learn what has been the experience of those who have adopted a maintenance lighting scheme.

I have already observed that gas supply and its use differ from any of the other public services. It is scientific and technical from the gas-works to the appliances. This brings one to the important and difficult problem of the inspection and oversight of piping in gas consumers' premises. It should be premised as regards piping fixed free of charge by the gas department for cookers, fires, and other heating appliances, that this piping remains under their control. The problem of exercising control over piping and fittings in houses is an immediate one, and in my view can only be solved by effective legislation. The subject is *sub judice* at this moment as a result of the recent Board of Trade conference. A meeting of all the members of the National Gas Council in Scotland will be held at an early date in order to discuss the conclusions reached at the conference. As legislation stands, the model clause, if adopted, simply enables the gas undertaking to specify the size and material of the pipes and fittings to be laid by the consumer on his own premises between the street main pipe and the meter, so far as such pipes and fittings are to be covered over. This, however, falls far short of control over internal pipes and fittings. Legislative power should be provided to specify piping and fittings and inspect installations in new buildings before giving a gas supply, in order to ensure a satisfactory service. It is in the interests of consumer and supplier of gas that this power should be in the hands of the expert, who is, of course, the gas authority. It is indeed surprising that efficiency of service in piping and fittings should not be secured by general Act of Parliament compulsorily applicable to all gas undertakings large or small. This duty would be welcomed. The inspection of existing fittings is the greatest difficulty, and whether this should be done by the public authority, apart from the gas undertaking, is a matter requiring most careful consideration. The whole subject will shortly be dealt with, and practical consideration given to all the interests involved.

SERVICE OF BRITISH COMMERCIAL GAS ASSOCIATION.

This Association acts as the executive administrative authority of the gas industry in the commercial sale and uses of gas. It is administrative in the national interests of gas supply, and provides all the machinery necessary for any single gas undertaking to expand its business, and supplies to each undertaking the complete knowledge required by the gas-consuming public of the potentialities of gas. The Association exists as adviser to municipal gas committees, company directors, and officials. I have been careful to define clearly the exact scope of duty of the Association, as I am aware there exists a feeling that its work should comprehend local endeavour. This is not the case. However skilfully managed the work of the Association may be, it should be clearly understood that it is left, very largely at least, to each particular undertaking to carry out its individual work in its own community. No municipal or company gas undertaking, the smallest as well as the largest, can hope in these times of competition to conduct its business effectively, and with profit to itself, without the aid of the commercial organization of the premier association. Selling gas requires education and training. The responsibility rests with each undertaking to make use of the work of the Association in publicity and effective advertisement. The gas industry welcomes publicity in informing the public of matters of public health, smoke prevention, economies in the household and in industry where gas plays a part. The industry is a national asset in coal conservation, fuel economy, and in producing chemical wealth. Everything is to be gained by publicity, and the Press welcomes accurate and useful information. The Association has done real work in improving the standard of service in gas supply. It promotes research in connection with the various applications of gas. It has done important work in attracting to the aid of the industry the personality and influence of noted men of science, and men occupying important positions in industry whose opinions are weighty and powerful.

May I conclude by referring to the absolute need of supplying gas of constant quality and with adequate pressure—this is imperative, and the public should not be allowed to be inconvenienced by insufficient supply—the provision of the correct type of gas appliance, substantial and satisfactory in its use; and the maintenance of apparatus in efficient condition. Our business is a continuous service, and our relations with the consumer are constant.

DISCUSSION.

The CHAIRMAN said there were many points in the paper for which he felt personally grateful to Mr. Napier.

Bailie HUNTER (Perth) remarked that it was only when one got behind the scenes of the gas industry that one realized the extent of the ignorant and uninformed criticism often directed against gas undertakings. Personally, he had the highest admiration for Mr. Napier. There was a clamant need for education in regard to the gas industry; but he was disposed to think that the method of publicity adopted by the "B.C.G.A." and those interested in gas undertakings might be a little different.

Mr. SAMUEL MILNE (Aberdeen) said he noticed that Mr. Napier advocated the introduction of differential scale charges for gas consumers. He agreed with this; and while they did not have quite differential scale charges in Aberdeen, they had a system which worked out in much the same way. Last year the gas price in Aberdeen was the highest it had been for many years. This was a common experience with gas manufacturing concerns; but he was glad to say they had found themselves in the fortunate position of being able substantially to reduce it as from April last. On the subject of maintenance, he was prepared to agree that, if they were meaning to retain gas for lighting, it was necessary to have a systematic and periodical inspection of all burners. Experiments along these lines were, he noticed, being tried in Glasgow; and they would watch very carefully the experience and the results obtained in that city. In Aberdeen, they had introduced a system of making a periodic examination of the gas heating appliances in restaurants and hotels. He had been induced to try this sytem as the result of a personal visit to one of the city cafés. He noticed then that the amount of waste that was going on was little short of lamentable.

Mr. NAPIER said he did feel that what they ought to impress on the public mind was that gas undertakings did not exist for the purpose of making huge profits.

LUNCHEON.

The conference at this point adjourned for lunch, on the invitation of the Corporation of Dundee. Lord Provost Spence presided at the luncheon, which was served in the Marryat Hall. Bailie Hunter (Perth) proposed "The Corporation of Dundee," which was acknowledged by Lord Provost Spence.

A report of the proceedings at the afternoon session will be given in next week's "JOURNAL."

Early History of the Gas Process.—The Newcomen Society (organized for the study of the history of engineering and technology) are promised, for their meeting on Tuesday, March 20, a paper by Mr. David Brownlie, B.Sc., F.I.C., on "The Early History of the Gas Process." The meeting is at 5.30, at No. 17, Fleet Street, E.C.

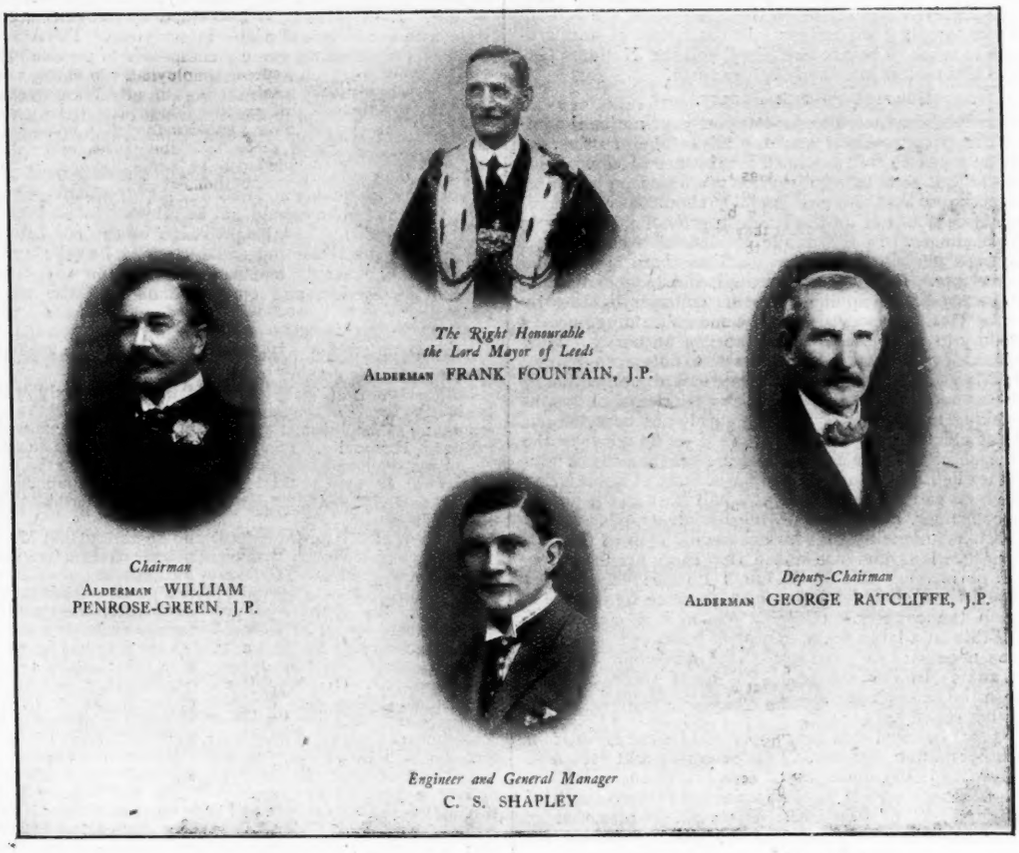
The Destructive Distillation of Wood.—We have received a copy of a new book, which is to be published immediately, entitled "The Destructive Distillation of Wood," by H. M. Bunbury, M.Sc. (Bris.), B.Sc. (Lond.), A.I.C. The price is 35s. net; and the publishers are Messrs. Benn Bros., Ltd., 8, Bouverie Street, London, E.C.4. A review of the book will appear shortly in our columns.

Wales and Monmouthshire Gas Salesmen's Circle.—Llanelly was selected for a meeting on the 22nd ult. of the Wales and Monmouthshire District Gas Salesmen's Circle, when representatives from a number of undertakings were present. The Manager and Secretary of the Gas Company (Mr. Harold Barker) welcomed the visitors on behalf of the Directors. Thereafter Mr. G. Steele took the chair, and Mr. E. Morris, of Briton Ferry, read a paper on "Objections by Consumers to Gas-Fires, and How to Meet Them." This paper, and a report of the subsequent discussion, will appear in the March issue of "THE GAS SALESMAN."

THE NEW FIVE-MILLION VERTICALS AT LEEDS.

THE OFFICIAL OPENING AND LUNCHEON.

Thursday, the 1st of March, 1923, was appropriately termed by Mr. C. S. Shapley, Engineer to the City of Leeds Gas Department, an "epoch day" for the Corporation, when a distinguished party, representative of many cities and gas undertakings, assembled at the Meadow Lane Gas-Works for the official inauguration of the new vertical-retort plant. In other columns of this issue we reproduce, from an admirable brochure prepared by Mr. Shapley, full particulars of the new plant, which consists of a Dempster-Toogood bench and a Glover-West bench side by side, and each of a capacity of two-and-a-half million cubic feet per diem. Here we give a general account of the proceedings at the works and at the luncheon which followed.



The Right Honourable the Lord Mayor of Leeds
ALDERMAN FRANK FOUNTAIN, J.P.

Chairman
ALDERMAN WILLIAM PENROSE-GREEN, J.P.

Deputy-Chairman
ALDERMAN GEORGE RATCLIFFE, J.P.

Engineer and General Manager
C. S. SHAPLEY

Meadow Lane.

Those who assembled at the works at 11 o'clock included the Lord Mayor (Alderman Frank Fountain), the Chairman of the Gas Committee (Alderman W. Penrose-Green), the Deputy-Chairman (Alderman George Ratcliffe), Alderman C. H. Wilson, and many members of the City Council. Alderman Sir William Kay (Chairman of the Manchester Gas Committee and ex-Lord Mayor of that city) and Prof. A. Smithells, C.M.G., F.R.S., were present; and the Contractors were represented by Alderman Fred West, Mr. J. W. Broadhead, and Mr. Samuel Glover. The technical and commercial sides of the gas industry in all parts of the country were also well represented. Mr. Shapley was ably assisted throughout the proceedings by Mr. P. Wheeler, the Manager of the Meadow Lane Works.

The first business undertaken was a photographic group, which a shower of rain failed to mar. This was carried out in the coke yard, round which extends the overhead telpher track with its almost noiseless grab carriage and control cabin. Noise at Meadow Lane, as a matter of fact, is now a feature remarkable by its absence, as was testified later by the Deputy-Chairman of the Gas Committee, who was under the impression, while waiting in the yard, that the new vertical plant was not working.

Alderman W. Penrose-Green then performed the official inauguration of the plant by moving a lever controlling the electric wagon-tippers, and twenty tons of coal rapidly disappeared, to begin its progress aloft and transformation in descent. The company was then divided into small parties, each with two guides; the following gentlemen efficiently performing the latter duty: Messrs. R. W. Webb (Manager, New Wortley Works), P. Wheeler (Manager, Meadow Lane Works), F. Cooper (Mains Superintendent), C. P. Tooley (Manager, York Street Works), G. Edwards (Chief Draughtsman), H. Shewring (Assistant Manager, Meadow Lane Works), G. Appleyard (Assistant, New Wortley Works), F. Firth (Chief Chemist), A. H. Clucas (Assistant Chemist), Keith Brown and W. H. Barker (Shift Engineers). Mr. E. King (of Messrs. R. Dempster and Sons), and Mr. H. Dodd (of Messrs. West's Gas Improvement Co., Ltd.), also lent their assistance. The route to be taken was indicated by signs, and suitable intervals were allowed between groups—thus obviating the confusion which has been known to arise on such occasions. The route led from bottom to top of the Dempster-Toogood installation, across at retort-charging level, and down through the Glover-West plant; the two sections being laid out parallel and with common coal and coke handling plant, as is described in later columns. Before beginning the ascent, however, the visitors saw the central-control electric switch-room, a feature of which is that the current may not be turned on to any part of the conveying plant, &c., until an attendant on the particular plant has signalled safety by switching on a white light in place of a red one over the control. Next to the switch-room are situated the stokers' mess-room (fitted with a cooker), their lavatory (with basins and a bath), and the shift engineer's office, outside which is the electric light control-board for the whole plant.

For the "lay" members of the party the whole installation must have been very wonderful and very interesting; and for members of the gas industry it was an incomparable opportunity for comparisons, for the two plants side by side, of equal capacities, vary in almost every detail from charging mechanism to coke extractor—setting lay-out, retort shape, flue construction, producer grates, coke bunkers, and waste-heat boiler provision, to call attention to a few features out of many which may be found fully treated in the description elsewhere. After the inspection, light refreshments were served, and the party proceeded in cars and special trams to the Town Hall.

The Luncheon at the Town Hall.

The luncheon, offered by the Corporation, was served in the Lord Mayor's Rooms at the Town Hall, the company being seated at numerous small tables in the long banqueting hall, in the centre of which was the Lord Mayor's table. The arrangements left nothing to be desired; the cuisine was excellent, and the toast list admirably dealt with, many points of topical interest being

brought out. The proceedings culminated with the presentation to Alderman W. Penrose-Green, the Chairman of the Gas Committee, of a handsome silver centre-piece for flowers. This was from the Contractors as a memento of the occasion; and the presentation was marked with great enthusiasm.

After the Loyal Toast, given by the Chairman, had been duly honoured,

The LORD MAYOR (Ald. Frank Fountain) rose to propose the health of the Gas Department. It was, he said, a great privilege to propose this toast. He was happy to be able to record the fact that he had been a member of the Gas Committee before undertaking his present responsible and respectable job. (Laughter.) He was, however, still waiting for the illumination—there was always much to learn in the technicalities of gas making. He could assure them that the Gas Committee were always threshing-out problems in the best manner, and that they did in fact get down to the things that really mattered. The inauguration which they had witnessed that day had been looked forward to not only by the Gas Committee, but by the whole public of the City of Leeds. The Leeds public made no great outcry about anything in particular, but just said "Carry on," expecting the Corporation to do their best on their behalf. The Gas Committee had undoubtedly aimed at the consumers' good. The new vertical-retort plant was a wonderful installation. They had expected a demonstrative display; but they had been struck by the silence of a wonderful and powerful process. That day they had had the pleasure of meeting Sir William Kay, the Chairman of the Manchester Gas Committee, and it was notable that Sir William did not want to confine to Manchester the good things that city possessed, for he had invited them all to visit Manchester, and see and learn what they could. During the inspection of the Meadow Lane installation, the guide of his party (Mr. Wheeler) had failed to elicit from them any questions; but after a time a most important question had occurred to him (the Lord Mayor). How many workmen had been displaced by this new and marvellous plant? In the Lord Mayor's opinion this was one of the most serious aspects of modern scientific progress, and an aspect which they should all bear in mind. He had been informed that the workmen themselves had been concerned about it, and had approached the management with a deputation on the subject. They had been informed that the Department had too much regard for their old hands to turn them on the streets, and, as far as possible, they had been absorbed into the new organization. He, personally, was very thankful, and he had realized that, although the development of mechanical science made the displacement of men inevitable in one place, nevertheless it reacted and brought about employment in another. Speaking now as a Trades Union official, he was able to record that any department of the Leeds Corporation had treated him as such with courtesy and consideration. He wanted to strike this note—that whether it was Leeds or Manchester, or anywhere else, the relationship between officials and men should be the best attainable; and an immense amount could be done by the application of reason, common sense, and mutual understanding. He would remind them that the loss entailed by any stoppage of work was never the concern of one side only, and the great thing to avoid in any dispute was the "back feeling" often engendered. It was with the greatest possible pleasure that he proposed the health of the Gas Department, coupled with the Chairman, the Deputy-Chairman, and Councillor James Noon.

Alderman W. PENROSE-GREEN (the Chairman of the Gas Committee), rising to reply, sought to put the Lord Mayor at his ease as far as labour in the Gas Department was concerned. His Committee paid the greatest attention to the maintenance of good feeling. The last visit which the City Council had paid to the gas-works was in 1906, when they went to see a new installation of inclined retorts. The latter marked a very distinct advance on the old hand-stoking methods, and had resulted in the possible production of 9000 to 10,000 c.ft. of gas from a ton of coal, which was then considered good working. Science, however, had not been still, and that morning, by the movement of a little lever, he had set twenty tons of coal moving through the new plant. This vertical-retort installation was a much greater advance on the inclined retorts than was represented by the step from hand-worked to machine-stoked inclineds. It was his opinion that even now scientists would not stand still, and that their discoveries might possibly result in the manufacture of cheap gas synthetically. The new plant would make 18,000 to 20,000 c.ft. per ton of coal carbonized; and in spite of the larger output, less arduous labour would be required to carry out the work, for the main idea was the utilization of gravity. He emphasized the better conditions of labour—gas-making was now a drawing-room job in comparison with the old days; and the coal was never touched by hand. Leeds now possessed a very large gas undertaking capable of putting out 21 million c.ft. of gas a day. They had also a benzole and a carburetted water-gas plant, and in addition purchased gas from a colliery and purified it in their own plant. This latter business they hoped to extend, as the Committee held the opinion that great economy was realizable thereby. The Corporation originally purchased the undertaking from the Leeds Gas Light Company in 1870; now they possessed three complete works. They were very proud of having been able to maintain the supply of gas throughout the great coal strike, although this had been accomplished at a loss, for it had cost them from £70,000 to £80,000. The new installation was going to be the means of reducing the price of gas to the public; but cheaper gas meant greater use of the commodity, and greater freedom from the smoke evil. Engineering works would use more gas, for by reason of easy temperature control it was more economical than coke or coal. Alderman Penrose-Green made a striking reference to smoke fogs—a smoky town was not only dirty, but unhealthy. The Gas Committee had decided to encourage the use of the gas-ring—every worker should brew his morning tea or coffee on a gas-ring; and the increasing sale of gas cookers and fires meant increasing health. As Chairman of the Gas Committee, he wished to acknowledge the readiness with which information had been given them by other towns, as a result of which they had been able to instal two plants second to none in the country, even in Europe. Referring to the artistic brochure prepared by Mr. Shapley, he hoped this would be widely read—not only by those present, but by the gas men of other towns. He (the Chairman) considered that Leeds would now be an ideal town for prospective users of gas to visit, for they possessed three separate systems of vertical retorts—the Dessau intermittent verticals; the Dempster-Toogood system (the representative of which, Mr. J. W. Broadhead, was with them), and the Glover-West system, represented by Alderman Fred West and Mr. Samuel Glover. Leeds in its turn would be pleased to give information to other towns; he considered this trait of handing-on knowledge was a distinct asset, and one which tended to universal progress. In conclusion, he referred to the expeditious and thorough work of the Contractors.

Ald. GEORGE RATCLIFFE also replied to the toast, saying it was a very proud day in the history of the Gas Committee. This was his twenty-seventh year as a member of the Committee, and during that time his interest in the work had grown. It was during his late chairmanship that he had suggested the Council's visit in 1906, and he felt that such visits to works were too few. The money spent on them was well spent, for it was in this way that members of the Committee learnt more about their job. A reference had been made to the lessening of employment by the growth of mechanical science; but he reiterated the statement that the cheapening of a commodity in one channel must necessarily spread employment in others. The Lord Mayor had perhaps purposely omitted to specify the intended reduction in the price of gas, and he was able to inform the company that it was their intention to lower the price by 6d. per 1000 c.ft. as from April 1. It was a great pleasure to the speaker to see Alderman Tetley present, which reminded him of the period when the Gas Department were assailed by imputations of air being drawn in to be distributed to the consumers; and Mr. Ratcliffe's references to this caused considerable amusement to those present. Speaking seriously, however, he laid emphasis on the curious fact that during his twenty-six years' service on the Gas Committee, among the complaints which he remembered he could not recall a single suggestion from consumers respecting bad gas-fittings. It never occurred to them that their fittings might be at fault; and he instanced, as an example, complaints from the occupiers of a large building which was found to be served by a ½-in. supply-pipe. He could assure them that there was no reason why anyone in Leeds should have a bad light, for any complaints would be remedied within twelve hours. He, too, wished to express his gratification that one municipality was never happy with a good thing until it had handed on its discovery to another municipality. Speaking of those who served the Corporation well, he referred to the splendid work of Profs. Smithells and Cobb; he would say more—in war their activities had perhaps helped to save the country. They had splendid officers in Mr. Shapley and his staff, and he hoped they would remain for many years. As for the new installation, he had been struck by the absence of smoke and noise, while all was activity within. He ended with a clarion note—"Gas is not played out; it is in its infancy."

Councillor JAMES NOON also supported his colleagues in acknowledging the toast. The City would watch both installations with interest—not only as they were going to produce more gas per ton of coal, but because of their potentialities in smoke prevention. He too was delighted to have met Sir William Kay, and he for one was certainly going to see the arrangement of the Manchester plant—how they dealt with their coal, how they treated their men, &c.; and he felt sure that Leeds would not rest till they were as good as, or better than, Manchester. He trusted all those who were not on the Gas Committee would give them their help, for they were not going to rest content with a reduction of 6d. per 1000 c.ft.

Alderman C. H. WILSON then rose to propose the health of the visitors. Alderman Wilson is Chairman of the Finance Committee, and a power on the Corporation. He personally found that the meeting had been very illuminating. He lamented the fact that a war order had curtailed the taking of profits from municipal undertakings for the relief of the rates, and bemoaned the tendency of Parliament generally to limit this procedure. Though the Gas Committee might discover good things, nevertheless they omitted to pass them on to the Finance Committee. [Laughter.] He was delighted to see present the representatives of some twenty cities and towns; it was a most important toast that he had to propose. He reminded the company that Sir William Kay, besides his other activities, was Deputy-Chairman of the Ship Canal—an undertaking which brought untold benefits to their towns. He compared the friendly rivalry of present-day cities with the old-time Etruscan warfare, when it was the aim of every township to blot out its neighbour. In addition to Sir William Kay, he coupled with the toast the names of Mr. Wilkinson, who was present from Nottingham in the regretted absence of Alderman Ball (ex-Lord Mayor of Nottingham), and Mr. J. W. M'Lusky, of Glasgow. He, the speaker, in his early days had gone to Nottingham to learn a thing or two in the days of Sir George Johnson, and among them he had learned of the deposit as a security for gas consumption, and of the advantages of quarterly accounts.

Mr. C. S. SHAPLEY, the Engineer to the Department, supported this toast—with diffidence, as he followed such an eloquent speaker. He felt it was an epoch day for Leeds. He had preached smoke prevention for a long time, and would continue so to do. When he came to Leeds five years ago, having always had to deal with company-owned undertakings, he had mixed feelings as to going to work with a Corporation; but he had found them baseless, having had every support from the Gas Committee, from all the members of the Council, and from an enthusiastic staff. He hoped for still further development, and that all those present would see it. To the names mentioned by Mr. Wilson, he wished to add one—that of Mr. Morrison, late Engineer of the Sheffield Gas Company, under whom he had had the privilege of working. Mr. Morrison was at one time proud to be selling the cheapest gas in the country, and now he assured his old chief that Leeds was going to emulate Sheffield in that particular. He thanked all the visitors for their attendance, saying that it was an honour to have such an assembly; and in conclusion, he wished to endorse all Mr. Wilson's remarks.

Alderman Sir WILLIAM KAY expressed the thanks of the visitors for the opportunity of inspecting and making comparisons between two of the best-known systems of gas making. He himself had particularly appreciated the visit. Leeds had successfully accomplished the conversion of a city station from what was perhaps a nuisance into a great

public service. The two plants side by side offered wonderful possibilities of comparison. He would remind them that in Manchester they were able to compare the Glover-West and the Woodall-Duckham systems side by side; and Manchester and Leeds together should be able to compile the most complete statistics. As far as Manchester was concerned, comparison of their two installations had shown that there was room for both; and fair competition among manufacturers was undoubtedly the only way to produce the best. He held very strong views indeed as to the appropriation of profits, and very different views from those of the proposer of the toast. No less than 3¼ millions sterling had in Manchester been paid over to the rates; but he maintained that that money for nothing was not appreciated—better to follow the example of Belfast and build a City Hall. It was the bounden duty of a Corporation to give the consumers the best service in return for a monopoly; and if it would help them in any way, everything was open for their inspection in Manchester. In that City they had effected an increase of consumption of three million cubic feet a day through the provision of equipment suitable for burning gas Price was the only advertisement for gas; it must be made cheaper than coal. The Gas Department was without doubt the milch-cow of a Corporation. Gas service was more elastic, and offered greater opportunities than any other. From the money point of view, electricity was no good; and comparing the utilization of coal for producing gas and electricity, and the yields of other products obtained from the two, Sir William asked how electricity could be expected to stand against gas. With its heat content of 3420 B.Th.U., the unit of electricity would have to sell at about ½d. in order to compete with gas. He wished success to the Leeds Gas Department as a public service.

Mr. WILKINSON, of Nottingham, expressed regret that Alderman Ball had been prevented by illness from being present. He thanked the Corporation of Leeds for what was not only an excellent entertainment, but also an intellectual treat. It was the finest gas installation he had seen, and the Committee and their Engineer were to be congratulated upon it. In his opinion, the plant was bound to prove remunerative.

Alderman W. PENROSE-GREEN then proposed the health of the Contractors. He was sure those who had visited the installation must be pleased at what they had seen; much thought and scientific work had been put into it. The Committee had visited the plant of several towns without being fully satisfied, but finally they had seen at work the two systems in question, and wanting a capacity of five million cubic feet a day had decided to instal some of both. The decision was not regretted; they were fully satisfied. The principles on which the firms worked were sound—as a mechanical engineer he had visited their drawing offices, and had found them well equipped. He considered that gentlemen like Mr. Fred West and Mr. J. W. Broadhead were an asset to the nation, and were supplying a long-felt want. He called attention to the fact that the foundations for the vertical retort-house were carried out by Mr. Shapley and his staff, and successfully carried out in the face of considerable difficulty. Flattery of the Contractors was impossible, in view of the excellence of the work they had done; but he would like to mention that the guaranteed output of the plant was being exceeded He congratulated them on their work.

Mr. J. W. BROADHEAD, replying, in turn complimented Leeds on possessing such works. The thoroughness of the conversion carried out was evidenced by the use of the old inclined retort-house as a 10,000 ton semi-automatic coal-store. He had attended many official openings; but this was the best-arranged inauguration he had known. The cleanliness of the plant was a point for congratulation of the Engineer—his plant was clean, not only on that day, but always; and this was a feature which spoke well for any plant. From the employment of two contractors on a big job, one might have expected overlapping; but the plans and specifications submitted to them had avoided this. He could assure them that it had been one of the most pleasant contracts he had had to carry out, for there had been no friction, and the assistance of the staff had been much appreciated. He thought his firm and Messrs. West's might be considered as a couple who had got on very well while they were engaged, and now they were married would live in love and harmony. Mr. West was going to make a presentation, and he (Mr. Broadhead) wished to associate himself with the good feeling symbolized by the token.

Alderman FRED WEST wished to associate himself with all Mr. Broadhead had said, and added his thanks for the cordial reception of the toast. Following out Mr. Broadhead's excellent simile, Mr. West expressed the hope that it would be a long time before the two systems were divorced. He congratulated the Chairman and the Gas Committee on their intelligent anticipation of the City's requirements, and Mr. Shapley on his general arrangements. He emphasized the fact that while in one direction there might be a saving of labour, science called for additional responsibility in another. It had been rightly said that retort-houses were now fit to live in.

On behalf of Messrs. Robert Dempster and Sons, and Messrs. West's Gas Improvement Company, Mr. West then asked the Chairman of the Gas Committee to accept a handsome silver centre-piece as a memento of the inauguration of the plant—an act which was marked with considerable enthusiasm on the part of those present, and was charmingly acknowledged by Alderman Penrose-Green.

The proceedings then terminated.

NEW PLANT FOR THE CITY OF LEEDS GAS DEPARTMENT.

On Thursday last there was inaugurated at the Meadow Lane Gas-Works of the City of Leeds Gas Department the new five million cubic feet vertical-retort installation. The following historical particulars and description of the new installation is taken from an artistic and profusely illustrated souvenir brochure compiled by Mr. C. S. Shapley, the Engineer and Manager. Our report of the proceedings at the inauguration ceremony will be found on p. 608.

GENERAL DESCRIPTION OF UNDERTAKING.

The Leeds gas undertaking dates from the early days of gas lighting; Leeds being one of the first towns to adopt this system of illumination. On May 8, 1818, an Act of Parliament was obtained giving statutory powers to the Leeds Gaslight Company "for the purpose of producing inflammable air or coal gas." This Company manufactured and supplied gas to the town from the York Street works. A point of interest is that the price of gas in 1818 was 12s. per 1000 c.ft.; and the total quantity sold for the year 1820 was 9,842,000 c.ft., or less than the amount which can now be produced daily at the Meadow Lane works. In these days meters were not generally in use, as will be seen from the following figures:

	C.Ft.
Gas sold by meters	134,000
,, ,, at price per burner	7,708,000
,, ,, for public lamps	2,000,000
	9,842,000

The population of Leeds in 1820 was about 83,000, or less than one-fifth of the figures of the last census. In 1835, statutory powers were obtained by a company, under the title of the Leeds New Gas Company, who erected their works on the present site at Meadow Lane. In 1857, the Leeds Gaslight Company extended their works by building a new gas-works at New Wortley. In 1896, an Act was passed empowering the Mayor, Aldermen, and Burgesses of the Borough of Leeds to erect gas-works and supply gas within the parish and borough of Leeds and the township of Roundhay, and to purchase, by agreement, the undertakings belonging to the Leeds Gaslight Company and the Leeds New Gas Company. This purchase was completed, and the works transferred to the Corporation, in 1870, at a cost of £763,225. Since that date the whole works have been largely extended and entirely re-modelled. The output of gas in 1870 was 870 million c.f., whereas in 1922 the total gas made was 3084 millions, an increase of over 250 p.ct. The gas sold per ton of coal carbonized in 1870 was 6960 c.ft., whereas last year it was 11,888 c.ft. The total capital expenditure to March 31, 1922, was £2,376,667, while the loans outstanding amounted to £1,260,714; the net debt being £1,022,057. The net profits applied to the relief of rates since the purchase of the undertaking amount to £274,312. The number of meters in use has increased from 58,700 in 1871 to 123,278 for the year ended Dec. 31, 1922. The area of the gas supply is 33,457 acres, of which 26,263 acres are within the city and the remaining 7194 acres outside its boundaries. Of the portion outside the city, to which the lighting powers extend, only 2000 acres are at present supplied with gas. During the war, a plant was installed by the Government for the purpose of extracting toluole and benzole from the gas; and 750,000 gallons were supplied for high explosive purposes.

With the completion of the installations of continuous vertical retorts, the total daily capacity of the three gas-works is as follows:

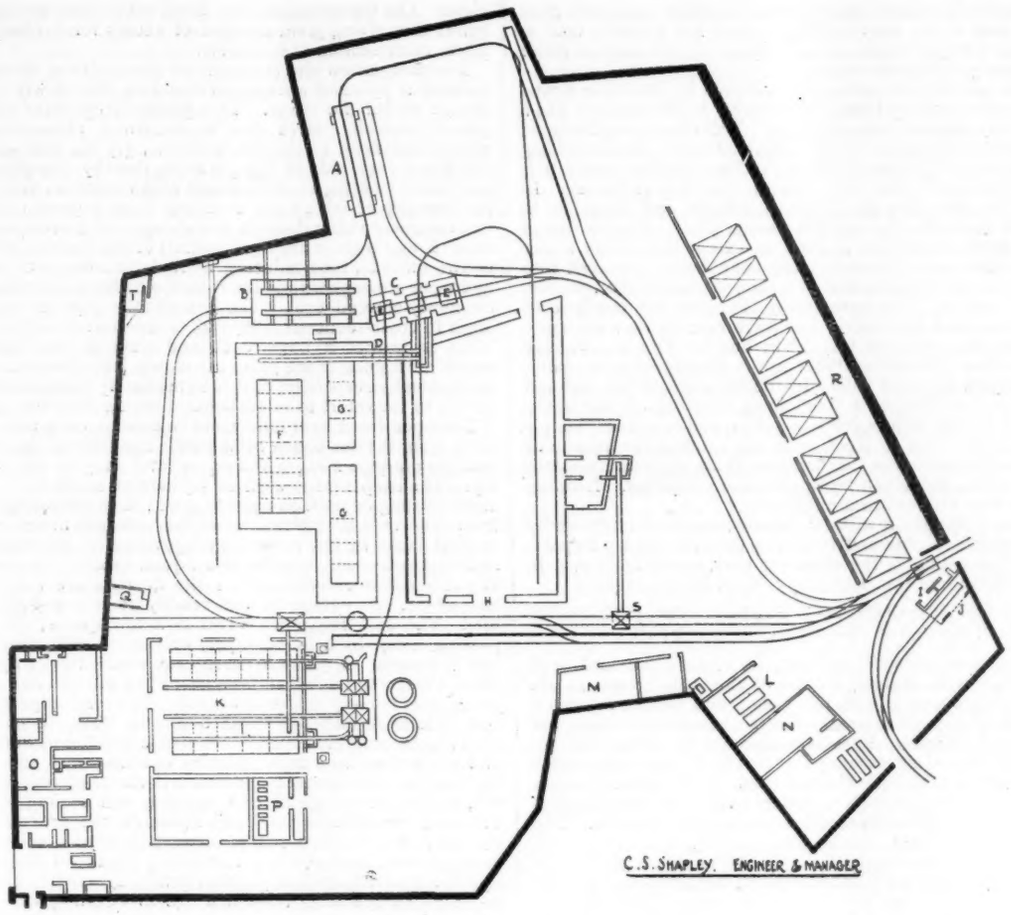
	Cubic Feet.
Meadow Lane works	8,000,000
New Wortley works	6,500,000
York Street works	1,500,000
C.W.G. plant, Dewsbury Road	5,500,000
	21,500,000

In addition, coke-oven gas is obtained, by means of a high-pressure main, from the Middleton Estate and Colliery Company. Upwards of 243 million c.ft. of gas was obtained from this source during the last year.

MEADOW LANE WORKS.

These works cover an area of 24,260 sq. yds. Prior to 1894, hand stoking was entirely in vogue. In 1898, the installation of inclined retorts (which are now in a state of demolition) were erected. The total capacity of this installation was 2,750,000 c.ft. per diem. In 1913, one bench of five beds, each containing eighteen 4-metre intermittent Dessau vertical retorts, was erected, capable of producing 1,150,000 c.ft. of gas per diem. In 1915, this plant was duplicated, the whole of which is now shut down for the summer season. The Meadow Lane works have many interesting features. As well as the coal-gas plant, there is a thoroughly up-to-date water-gas plant, capable of producing 5½ million c.ft. of gas per day.

The erection of the installation of continuous vertical retorts inaugurated on March 1 was the subject of a Ministry of Health inquiry held in November, 1920, when the Gas Committee were able thoroughly to satisfy the Ministry of the wisdom of this extension, with the result that borrowing powers were obtained. Contracts were placed with Messrs. Robert Dempster and Sons, Ltd., of Elland, for the coal and coke handling plants, and an installation of Dempster-Toogood vertical retorts, of 2,500,000 c.ft. capacity per diem, for the sum of £155,552; and with Messrs. West's Gas Improvement Company, Ltd., for an installation of



A. Coke Hoppers.
B. Dempster's Non-Corrosive Reinforced 4½ in. Brick Hoppers, 48 hours' capacity.
C. Coal Receiving Hopper under Telpherage.
D. Duplicate Coal-Handling Plant, 100 tons per hour.
E. Electric Wagon Tippers.
F. Glover-West Continuous Vertical Retorts, 2,500,000 c.ft. daily.
G. Dempster-Toogood Vertical Retorts, 2,500,000 c.ft. daily.
H. Existing Inclined-Retort House with all machinery utilized intact for Modern Semi-Automatic Coal Store, 10,000 tons.
K. Dessau Intermittent Verticals, 2,000,000 c.ft. daily.
L. Boilers.
M. Meters,
N. Exhausters.
O. Offices.
P. Pumps.
Q. Panel House.
R. Purifiers.
S. Receiving Hopper utilized for Coal Store.
T. Transformer House.

the Glover-West system of verticals, of similar capacity, for the sum of £88,742, or a total for the combined plants of £244,294. These, together with the 2,000,000 c.ft. intermittent vertical retort installations already installed, render the Meadow Lane gas-works unique in having three large and representative installations of modern systems of vertical retorts.

The New Continuous Vertical Installation.—The site of the Meadow Lane works presented many difficulties, and considerable thought was given to the important question of the best lay-out for the plant; and a careful study of the block plan will show the suitability of the position selected. The railway existing in the works did not lend itself to economical shunting. Therefore it had to be re-modelled and re-laid, with the result that to-day there is no shunting, but a continual stream of wagons which will feed any of the vertical retort installations; and, if necessary, the empty wagons can be filled with coke as they pass under the coke bunkers, whereby there is no congestion of traffic in the yard. The whole of the roadway has been specially laid out with granite sets on a concrete bed in order to cope with the heavy motor traffic. A 20-ton weighbridge has been installed which replaces an old 6-ton machine, and is capable of dealing with all ordinary traffic. The coal storage at Meadow Lane previously was not only expensive and far removed from the retort-houses, but there was no covered accommodation. The inclined retort-house, with its semi-circular roof, coal-breaking, handling, and conveying plant, and coke telpherage plant, has been adapted intact as a coal-store. The retort-benches are being gutted, leaving in position the buck-stays. The only alteration required was to link the telpher tracks so as to pass over the new coal-receiving hopper, and furnish the telpherage with grabs instead of skips; thus enabling the greater portion of the 10,000 tons stored being grabbed from the store and conveyed to the coal elevators. Coaling from stock or putting coal into stock is an exceedingly cheap operation, little trimming being required except when the stock of coal is very low indeed.

The whole of the excavations and foundations was carried out by the Gas Department. Excavations disclosed weak strata of running sand; so that sinking was continued to a depth averaging 18 ft. before firm strata were struck, when a good foundation of monolithic concrete was put in to carry the severe loading of the main stanchions supporting the vertical retort benches. Many difficulties were overcome. In connection with the coal-breaker pit, which is 28 ft. deep, serious difficulties were encountered owing to the excavations having to be carried through 12 ft. of water-bearing strata of coarse gravel. Pumping operations had to be carried on throughout the whole period; but, notwithstanding this, the pit is perfectly water-tight. Erection was commenced by Messrs. Robert Dempster and Sons, Ltd., on Oct. 17, 1921, and completed early in November, 1922; the first retort being charged on the 13th of that month. Messrs. West's Gas Improvement Company, Ltd., commenced erection on Jan. 9, 1922, and completed early in the New Year; the first charge being put in on Jan. 16, 1923. It will be seen, therefore, that no time has been lost in the erection of the plant.

Coal Breaking, Elevating, and Conveying Plant.—This plant formed part of the contract of Messrs. Robert Dempster and Sons, Ltd., and possesses several features of keen interest to the gas manufacturer. The keynotes are duplication of plant and change-over facilities; and may briefly be set forth thus: The plant consists of—Two wagon tippers (electric driven), one receiving hopper common to both coal plants, two reciprocating feed regulators, two rough-coal elevators, two screens, two by-pass shoots to breakers, two 4-roll breakers, two main (broken coal) elevators, and two cross push-plate conveyors. As each system of verticals is circumscribed by its own gravity bucket conveyor, handling coal by its top strand and bringing coke from the retort-house to screens by its lower strand, it follows that this coal plant as a whole is unique, thorough, and efficient.

With regard to the system of change-over, it may be noted that: (*a*) Either reciprocating feed regulator receives coal from the common receiving hopper and delivers at a predetermined rate to its rough-coal elevator; (*b*) either rough-coal elevator may serve either 4-roll breaker; (*c*) either 4-roll breaker (or the equivalent when using small or nut coal—its screen and by-pass shoot) may serve either main broken-coal elevator; (*d*) either main coal elevator may serve either cross push-plate conveyor; (*e*) either cross push-plate conveyor may serve either system of vertical retorts; (*f*) either main broken-coal elevator may serve

the "Dempster-Toogood" plant direct; (*g*) either cross push-plate conveyor may serve the auxiliary hopper for trucking coal or coke to the compartments of the hoppers without need of either hoist or gravity bucket conveyor.

The coke leaves each system of verticals by the lower strand of its respective gravity bucket conveyor. Each conveyor has a capacity of 25 tons of coke per hour. This plant is so designed that the coke is prevented from accumulating, to cause choking, and passes steadily through the respective screens, where it is efficiently screened with the minimum amount of breeze. In every way the screening plant is in duplicate, and either set of screens will deal with the coke from either plant. Duplication of parts has been carried out to such an extent that either motor will drive either set of screens; the coke being conveyed into large hoppers, for the reception of large coke, small coke, smithy, and boiler breeze. The coke-storage bunkers are constructed of 4½ in. reinforced brickwork, and have been made sufficiently large to take the coke for forty-eight hours. The hoppers are designed to load coke either direct to the railway wagons or into motor transport for local sale. In addition, should the rail and local sales not be sufficient to keep down the stock of coke in the hoppers, the telpher is brought into action, and it is a very simple operation to put coke to stock from the bunkers by means of the travelling shoot under the bunkers which delivers coke into the telpher skips, which can be tipped where required. Loading charges are thus reduced to a minimum.

The whole of the plant, with two minor exceptions, is driven by electricity, which is obtained from the City Electricity Department. The exception is the extractor gear, which is driven, in the event of failure of the electricity supply, by gas-engines.

THE "DEMPSTER-TOOGOOD" SYSTEM OF (STEAMED) CONTINUOUS VERTICAL RETORTING.

This 2,500,000 c.ft. installation consists of nine standard beds of four retorts each, making a total of thirty-six retorts in all. The beds are grouped five in one bench and four in the other bench, whereby expansion strains of the heated brickwork are kept within due bounds. These benches are in series, and are served with both coal and coke by (1) the "G.B." conveyor, which completely encircles the retort-house, and (2) the 2-ton capacity hoist and truckways, the rails of which pass under the benches and over the top of the storage bunkers above the retorts. The top level of the overhead storage bunkers is 63 ft. above ground. Though situated at this height, these bunkers contain 360 tons of coal, equal to 48 hours (or a full week-end) capacity, and 80 tons of coke, equal to 72 hours fuel for the furnace. These bunkers are compartmented so that a coal exit is furnished for every retort, a coke exit for every retort, and a coke exit for every furnace. Thus, the *sine qua non* of the principle of vertical retort carbonization—viz., the utilization of gravity—is applied to the utmost extent, as from this liberal storage not only does the coal gravitate to the retorts, but the coke gravitates to the producer and to the retorts after periods of scurfing, at the will of the stoker. Thus all manual handling of material is obviated, and no week-end labour is entailed to replenish the hoppers. The many compartments of hoppers are replenished either by (1) the top strand of the "G.B." conveyor, or (2) by the large ball-bearing trucks—(*a*) *via* the hoist; (*b*) *via* small loading hoppers at the elevator head—and a 2 ft. gauge inclined truckway, whence possible emergency is foreseen and guarded against. Access to this level is obtained by a staircase extending to the ground in easy flights, and with landing connection to all other working levels. The hoist, however, furnishes the most handy way, and it also gives access to all other working levels; so that the management can daily, and with great ease, supervise and control the working at every point.

The bench top level is 38 ft. above ground. Here much of the stoker's work is performed; and as he is immediately over the heated brickwork of the retort-bench, it will be interesting to consider how his comfort has been achieved, and the facilities adopted to ease his labours. The paving is tubular, and open to the atmosphere. These tubes are connected with the hollow chimney lagging of asbestos, whereby a current of atmospheric air is induced. This cools the paving, so that the hand can rest on it without discomfort, and the radiated heat from the independent chimney is so considerably reduced that adjacent bench mountings are surprisingly cool to handle. The mountings are right and left handed, and the gas off-take pipes lead the issuing gases to be dealt with in cool positions external to the bench brickwork, whereby ample working space is obtained for the men, to the betterment of their conditions and work.

In order that the "carbonizer" may construct the conditions best to suit each individual retort, and thereby get collectively the best working conditions for the men, combined with the best heat treatment of his raw material, the retort becomes the unit measure, and, consequently, each is separately heated, charged, discharged, and regulated for every function independently as follows: The gas-tight coal valve is vertically faced and is revolved completely, whereby it is self-cleaning. It admits coal for carbonization and coke for filling the retorts after periods of scurfing, thereby relieving the men of the necessity for manual handling of coke to retorts. The coal bin acts as a reservoir, and holds 8 cwt. of coal, equal to two hours of maximum demand, or three hours when steaming. As coke is extracted from the retort at the bottom, the coal gravitates in; hence the bin requires periodic replenishment *via* the valve. The bin is built so that the whole cross-section of the top of the retort (40 in. by 8 in.) is clear. The top mouthpiece is fitted with three machined poke-balls; thus giving great freedom of access for probing over the whole cross-section of the retort.

The coal passes into the retort on the centre of the major axis, forming a pyramid always surmounting the slowly descending charge within the retort. This pyramid, by virtue of its being placed centrally, gives rise to a natural phenomenon which proves beneficial to the process—viz., (1) the nuts on entering roll down each side of the pyramid, thereby (the process being continuous) setting-up a balanced coal condition, and increasing the porosity of the charge resulting from a given coal; (2) the evolved gases rising through the charge are more symmetrically divided, and pass to the right and left of the pyramid on their way to the off-take, thus inducing more intimate association of the hydrogen atmosphere and the valuable hydrocarbons issuing from the newly entered coal. The gas off-take pipe is exceptionally large in cross-sectional area, and is fitted with a liquor dribble. Thus is formed a large, cool, and inclined chamber, through which the issuing crude gases are slowly led, whence much of the mechanically suspended dust is immediately precipitated and returned to the retort to be carbonized among fresh tar vapours.

The open-luted hydraulic main is carried on a cool platform away from the hot bench brickwork. The seal can be adjusted to seal the dip-pipe 2 in., or the liquor level may be 2 in. below the dip. The deep seal is used at periods of scurfing; a light seal after scurfing or until the gas is good; then gradually the liquor level is lowered till the interior of the hydraulic main is controlled at level gauge by the retort-house governors. In every case the issuing gases meet considerable liquor, to dissolve immediately any ammonium chloride before the crystals are protected by a coat of tar. Any thick tar can readily be removed at the open lute. The seal regulating valve is 4 in. square; the overflow passing away by 6 in. tar-pipes, well fitted with cleaning caps and T flanges. Midway between each retort and its hydraulic is fitted a cleaning lid, which permits of the off-take and hydraulic being very simply augered at will. The exit pipe from each hydraulic is furnished with an 8-in. Peet valve, to enable each retort to be securely shut-off. A visible dribble of liquor is run into the inclined foul main adjacent to each retort, and, gravitating back to each hydraulic, maintains the inner surface of all mains wet, to the advantage of easy working and cooling of the gas. The four retorts symmetrically surround the producer. Each producer has its own independent chimney; thus conserving radiated heat, and sharing conducted heat and draught more equally. Leaving the independent details common to each retort, at the bench top level there are two 18-in. foul mains and two 6-in. tar mains (one on each side of the bench). These unite at, or adjacent to, the governors. The 10-in. retort-house governors are grouped at the bench top, where they are the more easily attended. They are in duplicate, work in parallel, and maintain the hydraulics at as nearly as practical level gauge. Each stands on a seal-pot, so that any thick tar which might be thrown down while the gases are passing the necessarily restricted and governing passages can be readily removed.

It is to be observed with continuous verticals that it is cool coke (the sensible heat of which has already been utilized) which is, to the advantage of the men, charged to the producers. The process of charging is simply to remove the lid and permit the coke to gravitate from the overhead storage bunkers.

Owing to the fact that primary and secondary air and the incoming coal are preheated by the outgoing waste heat, the margin of serviceable temperature is so small that the real efficiency of waste-heat utilization is to pass the waste heat immediately it ceases to function as a heating medium within the retort setting, and without traversing any connecting flues, direct into the boiler tubes. This is accomplished by placing on each bed a tubular boiler fitted with dampers, so that the waste heat may be diverted at will either *via* the boiler or to the chimney on each bed. By this means a useful pressure of 100 lbs. can be maintained, all-sufficient for bench services.

The top platform (31 ft. above ground), while being a plate girder bracing the bench, gives a walking-way completely round each bench. This platform gives easy access for adjusting the chimney dampers and to inspect the temperature of the extreme top of the retort. Further, as each retort is controlled by one damper only, it is at this level (where the temperature is only about 700° to 800° C.) that the main control damper is situated. This being arranged at eye level, the convenience of control is obvious. The lower platform (25 ft. above ground) similarly is a plate girder, bracing the bench, and likewise serves as a walking-way completely surrounding the benches. From this the combustion chambers or zone of maximum temperatures—viz., 1315° C. (2400° Fahr.) to 1350° C. (2500° Fahr.)—are inspected and measured by pyrometer. Furthermore, should adjustment between the right-hand and left-hand combustion chambers of any retort be required, the balancing dampers are at hand for ready control from this particular platform. The combustion chambers are fitted with glazed boxes to admit of seeing the internal conditions, without the need of disturbing those delicate propagations of flame by opening and admitting the atmosphere or the atmospheric pressure. To conserve the combustion chamber temperature against radiation losses, and to render the supervision of heats more comfortable, a 4½ in. course of special porous brick is built external to the bench walls; and so efficient is this insulation that the hand can be placed on these external walls of the hottest portion of the setting.

On the producer floor are situated the nine producers. Each ashpan is furnished with a grid and ashes hopper, so that all shovel work is saved; the ashes accumulating in this hopper until carted away at ground level. The producers are fitted with the "Elland" adjustable bar-screen inclined grates, the feature of which is that they totally obviate the need of clinkering, whence much fuel is conserved. In practice the grate is a screen. The slight motion of the fire down the grate screens-out the particles of ash before they are fluxed into clinker. The pan-ash contains but little usable coke. Altogether the fires on these grates are held very loosely, so that the coke is free-burning, thus permitting of these huge settings being worked at practically no draught or at level gauge. The producer gas is caused to rise up steeply-inclined flues within the heart of the setting, wherein inherent dust is largely precipitated before the producer gas enters the more highly heated combustion chambers, with obvious advantages to the life of the refractories. The primary air is *ad lib.*; nevertheless, the ashpit is furnished with doors, whereby the benefit of atmospheric pressure or level gauge on the firebars is added to the thereby retained invisible blanket of steam over all the grate area.

The mechanism platforms (7 ft. 6 in. above ground) extend each side of the bench, and give facilities for the attention to gear and adjustment of parts. The coke extractors are silent in working, and are separately adjusted for each retort from this platform. Each retort heats its own secondary air. Two secondary air slides are fitted per retort—one for each side of each retort—and are readily and finely adjusted from this platform. The steam services are at this level, and control cocks regulate steam to the primary air, to the furnace ashpan, and to the base of each retort for the steaming of its charge—usually 20 to 40 lbs. pressure through the $\frac{5}{32}$ in. diameter orifice.

On the ground level beneath the retorts are fitted cast-iron receptacles in which the cooled coke extracted from the retorts is allowed to accumulate, and whence it is discharged every two to four hours, depending on the vogue of steaming. During discharging, the coke is regulated from the receptacles to each bucket of the "G.B." conveyor by means of the rotary and travelling filler, all at the rate of 25 tons per hour. The "G.B." conveyor gently carries the coke either to the screens or to the storage bunkers over the retorts and furnaces.

General Features of the Installation.—A small steam pump, a high and a low level tank, connected through the services to foul mains, suffice to maintain steady flows of liquor throughout; the surplus liquor and tar overflowing to the gas-works underground storage tank. The refractories in the combustion chambers are protected by the sympathetic and intermediate disposition of the vital or active flame of ignition, such that the refractories most highly heated are in such a position that they are subject to the minimum of weight; relieved of the extremes of temperatures; relieved of the erosive effect of the moisture in descending coal and rising steam; relieved of the wear and tear of stokers' bars; are more easily re-set (any re-setting being within the uppermost 9 ft. 6 in. of the retort); and surmounted by a waste-heat flue, which dries the descending coal, the bench top ironwork being thereby cooled, whence the further advantages ensue of comfort to the men, reduced stress on refractories, and prevention of the formation of pitchy compounds.

The desiderata of coke extraction being sure and silent working and breeze prevention, the coke extractor consists of a smooth and inclined tray, having a stroke independently adjustable for each retort and also for each line of retorts. The egress for coke is 60 in. by 14 in., whence the largest formations of coke can traverse the tray side-by-side, there being no claws or guiding vanes to constrain or break the coke. The charge rests on the tray at the natural angle of repose; and on the tray slowly receding some 4 in., the coke gravitates down. The two-fold motion engendered overcomes all tendency of the coke to bridge, and the even descent of the charge as a whole is maintained with the greatest automaticity and on an even keel. In regard to the power required for coke extraction, 1000 c.ft. of gas per twenty-four hours suffices to develop this through a 4½ H.P. gas-engine.

To combine the advantages of the rounded shape of moulded retorts with the resilient strength of built-up retorts, the specials are grooved and tongued, and span the stay walls, so that there is no joint, other than bed joints, unsupported by a wall; thus the maximum strength, easiest working shape, and tightest construction are obtained.

THE "GLOVER-WEST" RETORT-BENCH.

The Glover-West retort-bench comprises nine settings, containing 72 vertical retorts, arranged in settings of eight and heated in units of four retorts. Each setting, therefore, consists of two units, heated by the combustion of gas generated in one producer, provided with one independent chimney and one waste-heat boiler, and is built with a clear space between it and the adjacent settings. It therefore follows that each setting can be brought into and out of action without in any way affecting adjacent settings, and adjustments of all kinds can be made to each setting without affecting others in the same bench.

The retorts are elliptical in section, tapering from 33 in. by 10 in. at the top to 39 in. by 18½ in. at the base, and are about 21 ft. long. They are built free of the brickwork of the setting, in tongued and grooved segments; silica being used in the combustion chambers, and hard fireclay at the top and base. The setting consists of the well-known Glover-West arrangement of horizontally divided chambers, divided also vertically in the plane of the major axis of the retorts; so that both sides of the retorts are equally heated by separately and readily controlled streams of fuel gas and products of combustion. Fuel gas rises from the producer in uptake flues with ports leading to the several horizontal combustion chambers. Secondary air is led round the base of the retorts, absorbing heat from the outgoing coke, and rises in uptake flues arranged in the outer wall of the setting adjacent to the water-gas uptake; thus intercepting radiated heat and combining insulation with regeneration. The secondary air, thus preheated, is admitted to the combustion chambers at two points, traversing the division walls, the stability of which is thereby increased; while the suitable disposition of the two points of combustion in the chamber ensures the equal heating of the four retorts in the unit. The products of combustion pass upwards through each dividing floor and circulate in the three chambers round the tops of the retorts, transferring the bulk of their residual heat to the incoming charge of coal before proceeding to the chimney. Each combustion chamber is provided with means of separate and independent adjustment. The possibility of varying the temperature of the retort at any point in its length to suit the characteristics of the coal being treated and the quality of the gas it is desired to manufacture, is thus attained; but the control of the setting is effected entirely by the adjustment of the chimney damper. Full facility of adjustment is therefore combined with simplicity of control.

The producers, in which the fuel gas for heating the retorts is generated, are of the open step grate type of an improved construction, in which the formation of clinker and the labour involved in its removal are reduced to a minimum. The ingress of primary air to the producer furnace is automatically and entirely regulated by the requirements of the setting and the pull of the chimney. The effective grate area is so much in excess of the theoretical requirements that there is no interference with the quantity and quality of fuel gas generated immediately before and after the cleaning operation, as in the older designs of producers. The grate steps are so disposed in relation to the flare bed, or entrance to the fuel-gas uptake, that the shortest distance between the two is at about the middle of the grate. Any clinker, therefore, which may be produced by the melting of a fusible ash, is formed at about the centre of the fuel bed, out of all contact with the brickwork. Such clinker is readily dislodged and driven to the bottom of the grate, where it is easily removed.

The nine waste-heat boilers, each of a nominal evaporative capacity of 500 lbs. of steam per hour, are capable of supplying steam for the whole of the retorts. These boilers are of the water-tube type, manufactured for this particular installation by Messrs. Thos. Green and Son, of Leeds. They are fitted with patent automatic feed-water regulators combined with low-water alarms. A feature of these boilers is the special arrangement by which the lower portion can be "dropped," thus readily exposing all the water tubes and the whole of the internal surfaces of the boiler for easy inspection. Each boiler is provided with a superheater capable of raising the temperature of the steam to about 500° Fahr. The boilers are arranged on a by-pass, so that waste gases can be led direct to the chimney if and when desired. They are operated under natural draught; and the control of this draught—and, indeed, of the whole of the operations of the setting—is maintained at the one point, the main chimney damper. The boilers and the steam-pipes to the retorts are well lagged, and there is an ample supply of stop valves, reducing valves, steam traps, pressure gauges, and thermometers. The feed-water is supplied by means of three 250-gallon electrically-driven single-ram pumps, with one double-stroke vertical steam pump, of 860 gallons per hour capacity, as stand-by.

The retort-bench bracing consists of ten lines of front and back buckstays, tied at the base to the heavy main supporting girders of the settings and at the top by means of the cross beams supporting the charging platform. The whole of the brickwork of the front, back, and end walls of the setting is sustained by several lines of horizontal rolled-steel joists attached to the buckstays and arranged to prevent undue expansion of the brickwork. The main supporting girders of the settings span between steel stanchions resting upon a substantial concrete foundation. The producer bracing is adequately tied to the bracing of the retort-bench. Each retort is complete with its own independent set of top and bottom fittings arranged so that each retort, as regards the coal-feed, coke-extraction, and gas offtake, is a separately controlled isolated unit.

Coal is supplied to the retorts from the overhead storage bunkers through a gas-tight coal-valve, which is opened by rotating the plug, by a single movement of a hand lever, every three hours. The charge of coal is retained in a coal-feed hopper capable of containing a three hours' supply of coal and in open and direct communication with the retort, to which it is attached by means of the top mouthpiece. To the latter is also attached the gas offtake pipe, fitted with a valve to control the passage of crude gas from the retorts to the collecting main.

The gas-collecting main is a chamber suspended above the setting, where the gas from eight retorts is collected and where the first condensates separate-out. From this main the liquors and gas flow together to a retort-house governor, below which is the seal-pot, whence the liquors flow to the tar and liquor wells.

The Glover-West coke extractor takes the form of a helical inclined plane, or "worm," turning on a vertical axis. The worm is constructed in two parts; the upper portion being readily turned

back on the lower, disclosing an opening through which the retort can be inspected. The speed of the coke extractor determines the rate at which the coal passes through the retort. The extractor is driven by worm gearing actuated by a ratchet and pawl motion drive from a lever oscillated at a constant speed. Between the pawl and the ratchet wheel is arranged an adjustable "mask," the position of which determines the number of teeth of the ratchet wheel engaged by the pawl in each oscillation, and, consequently, the speed of rotation of the worm. The ratchet pawl is fitted with a safety device, so that the gear is protected from damage arising from any possible obstruction. By the simple adjustment of this mechanism the rate of carbonization is adjusted to the requirements of the particular coal being treated in the installation. The coke is received in the coke chambers direct from the retort, and retained until discharged every two hours.

The overhead coal-storage bunkers, with a capacity of 48 hours' supply of coal, are supported upon stanchions forming a continuation of the front and back buckstays of the retort-bench bracing. The side and division plates of the bunkers are formed into deep steel plate girders to support the weight of the coal as as well as that of the retort-house roof.

The retort-house is of the usual Glover-West type, consisting of light, steel-panelled framing filled in with 4½ in. brickwork. The roof is covered with asbestos corrugated sheets attached to steel angle purlins; while ample provision for ventilation is afforded by the louvre at the apex. The floor consists of concrete built with the foundations and provided with a granolithic finish.

The whole installation is very fully provided with platforms giving access to all dampers, sight-holes, charging apparatus of the setting, coke-feeding doors of the producers, and all mechanical parts; and steel ladders and staircases are arranged to and between all platforms. An electric lift is also provided as an alternative for the same purpose. It is fully equipped with semi-automatic push-button controls, safety gates with electric locks in the cage and at all landings; so that the lift is brought to a standstill whenever a gate is left open. The steel-wire suspension ropes of the cage are fitted with safety grips.

Lip-Bucket Conveyor.—One of the most interesting features of the Glover-West vertical retort installation is the recently introduced lip-bucket conveyor. This conveyor is a post-war development of the West gravity-bucket conveyor, which itself is of a distinctive design, particularly with regard to the chains. The West driving and conveyor-chains are of the renewable bush type. They consist of two lines of stamped-steel side links, all parts of which are accurately proportioned to the stresses coming upon them, with a large margin of safety. Between the side links and the joint pin, however, a steel bush is interposed which is fixed relative to the side links. As the joint pin is fixed relative to the outer pair of side links, the wearing surface extends over the full width of the bush. The joint pin only moves relative to the bush at changes of direction. The main advantage of this design, however, is that there is no wear on the side links—it is all taken by the renewable bush. The buckets are suspended upon trunnions forming an extension of alternate joint pins of the lines of chain; the other joint pins extending across the whole width of the conveyor in the form of axles. Each joint is carried upon oil-retaining rollers running upon tracks.

The development of the gravity bucket into a lip bucket consisted, in the first place, in forming lips at each end of the bucket, so that each lapped over the next, and, in the second place, in increasing the size of the buckets so that unbroken coke direct from the retorts could be fed into them. The effect of these developments is that coal and coke can be fed direct to the conveyor without the addition of any mechanical filler, whereas the mechanical filler previously employed caused considerable breakage of coke, and was liable to rapid wear. In the present installation, the conveyor passes below the discharging floor and above the overhead coal-storage bunkers. Coal is received on the upper strand, conveyed, and discharged to the several compartments of the bunkers; the empty buckets descending at the end of the retort bench. Coke is discharged from the retorts and directed, by means of a travelling shoot, through an open charging trough, into the buckets of the lower strand. The full buckets travel along to the end of the retort-bench, where they rise, lifting the coke and discharging it to the screening plant before again receiving coal at the top strand. Coal and coke is thus handled at one and the same time and in the same conveyor at will. In the intervals of coaling, coke for the producers and retorts is taken by the conveyor and discharged into storage hoppers at the same level as the coal-bunkers. From these hoppers the coke is conveyed by means of hanging skips on ball-bearing carriers, to the several feeding doors of the producers, or to retorts restarting after scurfing.

All the mechanical portions of the installation are driven by totally-enclosed electric motors, manufactured by the Hinchcliffe Green Manufacturing Company, of Leeds, operating on the Corporation supply of alternating current, two-phase, 50 periods, at 200 volts—with the exception that, for the coke-extractor driving gear, a gas-engine is provided as a stand-by.

The Institution of Welding Engineers has been registered as a company limited by guarantee, the objects being "to promote the advancement of the science and practice of welding by means of gases or otherwise." The office is at No. 30, Red Lion Square, London, E.C.

ON LIGHTING AND BURNERS.

By F. V. BARNES, of Todmorden.

[A Paper read before the Manchester Institution of Gas Engineers, Feb. 24].

Gas engineers do not seem to have made the most of the advantages that gas affords in the matter of lighting. Apart from its low cost, it has been proved by experience and exhaustive tests that gas lighting promotes ventilation, is healthy, and is better for the eyesight than other forms of lighting. Gas lighting can be operated from a distance by means of pneumatic and other kinds of lighters, and much more could be made of the advantages of these systems than is done at present.

For some few years past the writer has been rather concerned as to the future of the lighting side of our business, not only as concerning the undertaking under his control, but as concerning the gas industry generally. No doubt many of you also will have given close thought to the subject.

One of the main reasons—perhaps one might say the main reason—why the industry may lose some of its lighting load is the number of "cheap and nasty" incandescent burners on sale to, and in use by, the public. These burners often only give about half the candle power which should be obtained from the gas used. They are made from the flimsiest of materials, and have only a comparatively short life.

The risk of losing our lighting will continue as long as gas engineers are content to let matters remain as they are, and make no attempt to see that the consumer is supplied with a good, substantial, and efficient burner. The writer does not intend to discuss the question of maintenance at present, as the consideration of such schemes is worthy of a separate contribution to our proceedings; and maintenance may be made to play a very important part in keeping our consumers well satisfied.

With regard to electricity, gas engineers should be broad-minded enough to recognize the use and suitability of this form of lighting in many cases; but they should also regard it as an axiom that gas lighting—particularly for the working and middle classes—is the most suitable and economical form.

The newspapers of to-day give glowing accounts of the uses to which electricity can be put, and the electricity industry deserves all praise for the great strides it has made during recent years in the way of electrical invention. To the man in the street there is a certain amount of mystery connected with electricity. This appeals to many, and gives rise to an exaggerated view as to what can be done with electricity—economically. If one surveys the progress made in electrical science, it will be observed that the advances made relate far more to the uses than to the generation of current. The generation of electricity still depends to a large extent on steam power, and this (as is well known) can only give at present a low thermal efficiency from the coal used. To counteract these wrong impressions in the mind of the general public, we require more propaganda work in the Daily Press, not only on the question of thermal efficiency and consequent waste of the Nation's coal supplies, but on lighting matters generally. One dose of information now and again will not serve the purpose; the dose should be repeated frequently, if any benefit is to be derived therefrom. The writer does not believe that the lighting side of our business will be a negligible quantity in a few years' time, but is of the opinion that, given proper attention by the gas engineers of the present day our lighting load can be retained. If the necessary attention is not given, we need not be surprised if we find gas displaced by other forms of lighting.

The members of the gas profession had recently presented to them a most instructive paper by Dr. Carpenter on "Incandescent Burners." Dr. Carpenter's burner is so well known that a description of it is unnecessary here. He has been working towards an ideal, and has probably reached as near to that ideal as present knowledge permits—*i.e.*, a constant gas, a constant pressure, fixed gas and air supplies, and no adjustments necessary by the user. He is in the fortunate position of being President of a large gas undertaking, where any slight accidental deviation from the standard quality by one section of his carbonizing plant can easily be rectified by the mixture of suitable quality gas from other sections. These conditions also obtain in many of the large provincial undertakings. But the engineer in charge of smaller works is not in the same fortunate position; and however much he may be in favour of burners with fixed gas and air supplies as an ideal, he is obliged to adopt in practice the burner fitted with means of gas and air adjustment. Another factor also helps to decide in favour of the gas and air adjustment being fitted—*i.e.*, the question of varying altitudes in the area of supply, and consequent variations in pressure. This applies more frequently to the northern counties, where abrupt variations in altitude are quite common. This disadvantage can be obviated no doubt by the use of district governors; but this adds to the cost of the distribution system, and a governor can be a source of trouble.

At this point the writer would say that from his own personal experience he prefers a fixed nipple for street-lamp burners consuming 5 c.ft. per hour or less, and gas adjusters for burners having three or more intermediate mantles. This may at first sight appear inconsistent with the previous statements; but such is not really the case. On the one hand, street lamps are connected directly to the gas-main, where there is, or should be, a

plentiful supply of gas, and the supply pipe is of such dimensions that there is no appreciable drop in pressure at the burner. It is not a difficult matter under these conditions to make a fixed nipple to give the correct adjustment. In the case of domestic burners the conditions are somewhat different. The supply pipe to the house feeds possibly several lights, a cooker, and other apparatus; also, the pipes leading to burners are often smaller than good practice requires, particularly in older houses. A uniform pressure cannot therefore be depended on.

Reverting to street-lamp burners, the writer prefers having an adjuster on the larger lamps, as these are generally fixed in more important positions. They can be regulated on the spot and under working conditions, instead of under test-room conditions, and can be given just that final regulation which makes all the difference between a passable and a good light. One could argue that if it is possible to make a fixed nipple for the 2-lt. burner, it should be equally possible to do so for a 6-lt. burner. Everyday use, however, shows the desirability of having an adjuster on the large burners.

The lighting load (as is well known) covers several important classes of lighting—namely, the lighting of public streets, mills, factories and workshops, school lighting, shop lighting, and domestic lighting. In the case of public lighting there is no question as to the ability of gas to hold its own when given proper attention and a fair chance. It is a fact that many of the members composing the councils of our local authorities are impressed with the supposed superiority of electricity. These members will press for electricity to be used whatever the cost and whatever the result. In some cases it may be the fault of the gas engineer for not having in times past given the best attention possible to his public lighting, thereby creating a desire for something better. In the absence of knowledge that gas can do better, and that cases of streets being poorly lighted by electricity exist, one cannot altogether be surprised at the attitude of these councillors.

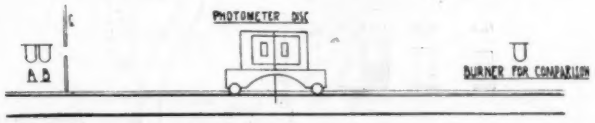
Recently the writer passed through the residential part of one of our well-known towns, and noticed that the burners (conversion fittings) were fixed very low in the street lanterns; and at the same time it was observed that a large number of the panes were cracked—the nature of the cracks showing that they had been caused by the heat radiated from the burner, due to its wrong position in the lantern. Not only does this cause high maintenance costs, but the illumination of the street is not nearly so effective as when the mantles are fixed well up in the lantern. With a mantle fixed low in the lamp the shadows of the frog and bottom of the lantern extend further round the base of the pillar; and if a superheater burner is being used, a certain amount of light is cut-off from the reflector, and so lost. These defects do not arise if the mantles are fixed so as to come just below the reflector in modern lanterns and below the waist line of the older type of glazed-top lamps. Since the street lighting is constantly before the notice of the public, good lighting in this branch can be considered a cheap and effective advertisement, and consequently is worthy of close attention. At any time, and particularly now that competition is so keen, the writer is of opinion that it is poor policy to endeavour to save a few pence in the first cost of a burner, when so much can depend on the results.

With the resumption of the normal public lighting after the war, the writer found that it would be necessary to renew a considerable number of his street-lamp burners, and after considering the weak points of burners previously in use, decided to make new burners, eliminating as far as possible the defects noticed. Previous experience had shown that the intermediate mantle was the most economical one to use, considering the amount of light required, and that the mantle breakage due to vibration caused by present-day heavy motor traffic is much less than with the universal mantle. The bijou is in most cases too small a unit for public lighting requirements. Another important consideration is the fact that with the intermediate mantle it is much easier to adjust the flame so as to get a higher efficiency than is possible with the universal mantle.

The first burners tried were the T-head pattern. This was soon discarded, as it was found that if automatic controllers were to be used, two by-passes would be necessary. When it is considered that the by-pass is lit during the whole of the lighting season, the gas consumption due to the extra one becomes an important factor. The next pattern tried had a circular superheater head and two mantles—one on each side of the upright stem. It was hoped that the gas would collect under the head, and that one by-pass would serve the purpose. Sometimes both mantles lit, but frequently one of the two failed to function. This pattern was therefore discarded. The next type of burner had the two mantles together, and a bunsen tube arranged on one side (see fig. 51, sheet 3). The details of the superheater are also shown in fig. 10, sheet 1. It will be observed that the centres of the mantles and bunsen tube are in one straight line, and not in the form of a triangle, as is the case with several 2-lt. burners on the market. This proved to be more suitable than either of the previous patterns tried, and was well adapted for use in conjunction with automatic controllers. The construction of this type of burner head was then extended to take three, four, or six mantles, for use where more light than was given by two mantles was required. (See figs. 52 to 55, sheet 3, and details in figs. 11 to 14, sheet 1.)

When noticing street lighting in towns where "circular cluster" burners were in use, having mantles numbering from four to ten, the writer has observed that practically only half the number of mantles were visible in any direction when viewed from some little distance away, and that only in the immediate vicinity of the lamp was the light from all the mantles fully utilized. As mantles are more or less opaque, it seemed that there was a possibility of making some improvements. To determine to what extent one mantle is transparent to the light from another mantle; the following experiment was tried.

Two mantles (A and B) on suitable burners were mounted one behind the other as shown in the adjoining figure, each burner being controlled by a separate tap. A metal screen C, having an aperture of 1 in. by ½ in., was so fixed in front of the mantles as to cut off all light from the edges of the mantles and prevent any projecting portion of the rear mantle throwing light on the disc.



Readings were taken with one and with both mantles lit; and the results showed that about 19 p.ct. of the light from mantle A passed through mantle B. The mantles tested were the loom-woven type. It will be obvious that mantles having a very open texture will allow more light to pass, and *vice versâ*. Also it should be observed that the edges of a mantle will be more opaque than the centre, owing to the increased number of threads forming a greater obstruction.

Lack of time has prevented further experiments on this matter at present.

Light in a horizontal direction remains horizontal and never reaches the ground; but for street lighting the light available below the horizontal, down to 20° below, is most important. It is this light which has to illuminate the roadway and footpath at distances furthest from the lamp, and no available light in this direction should be wasted.

It was thought that by arranging the mantles in zig-zag fashion a far greater efficiency could be obtained than by the usual circular arrangement. (See plans of street-lamp burners, figs. 11 to 14, sheet 1.) The arranging of the mantles in this manner makes it an easy matter to replace breakages, without damage to those adjacent; and when viewing the long side of the burner, the mantles present one continuous band of light. The curves on sheet 4 and figs. 52 to 55 will show to what extent these objects have been attained.

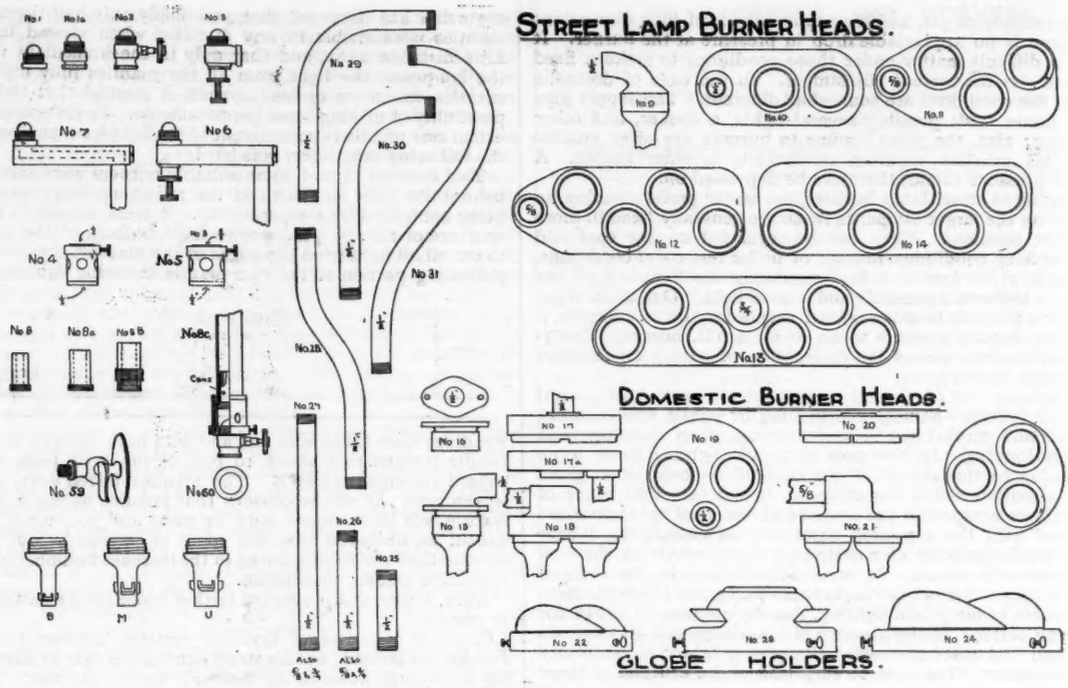
A 6-lt. burner arranged as in fig. 54 sheet 3 gave an average of 344 candle-power between 0° and 20° (curve E) in a direction at right angles to the long axis of the burner, and an average of 191 candle-power at right angles to the short axis. Compare this with the 6-lt. circular cluster which gave an average of 250 candle-power between 0° and 20°. (See curve D, diagram No. 1, sheet 4.)

A further reference to the lighting curves mentioned will show that the amount of light thrown in the downward direction is equal to and more than that thrown by the circular pattern of cluster burner. The curve diagram No. 3 on the same sheet shows a comparison of the light given out in a circumferential direction by the 6-lt. new-type burner and the light from a 6-lt. circular cluster. It will be noticed that the light is concentrated in two directions instead of being evenly distributed in a circular direction. It should be possible with burners of this type to secure a better distribution of light along the length of the streets, with considerable economy in gas consumption and the number of mantles required. Sheet 3 shows chiefly the conversion type of burner; but we have also a very convenient arrangement of burners fixed in the top of the lantern with outside gas and air regulation. [See figs. 55A and 58.]

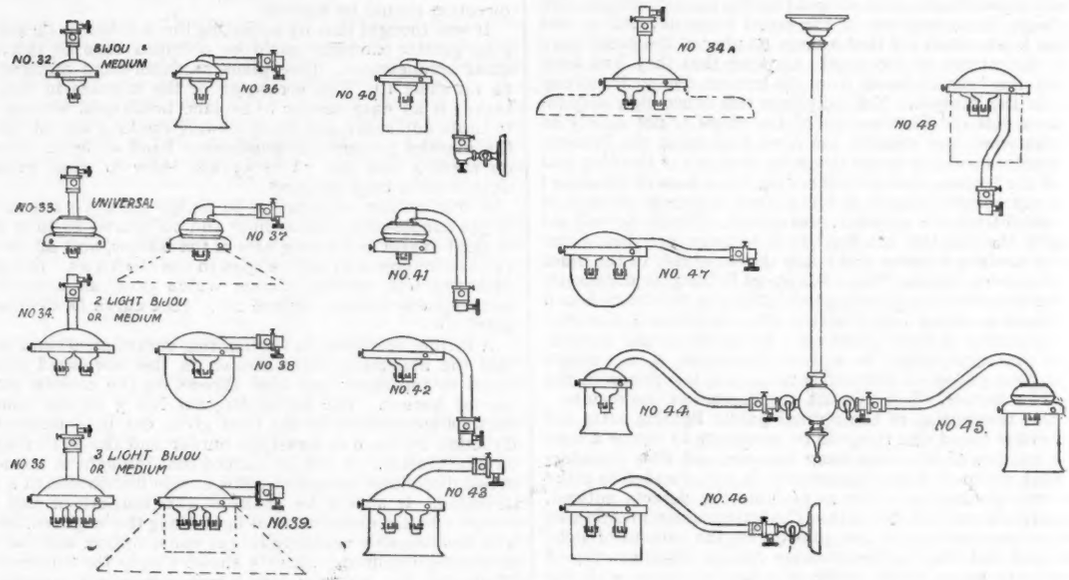
DOMESTIC BURNERS.

The gas industry is indebted to Dr. Carpenter for bringing into prominence the "shoddy" nature of many burners on sale to the public, and it is only too true that the inefficient results obtained by the use of these burners are the chief cause of many of our complaints of poor light and bad gas. When one knows that the gas sent out is good and up to the standard, it is somewhat disheartening to keep receiving complaints of poor lights, and then to find that the trouble is all due to inefficient burners. Some two years ago the writer considered the desirability of starting a maintenance scheme, but soon found that it would not be a complete success unless a good type of burner could be found to take the place of many of the flimsy burners in use. The burners should be readily adaptable for all kinds of lighting—*i.e.*, shops, workshops, school, dwelling-houses, public buildings, &c. With the burners at present on the market, this would have meant carrying a stock of several different patterns and makes, and the cost would have been a serious matter.

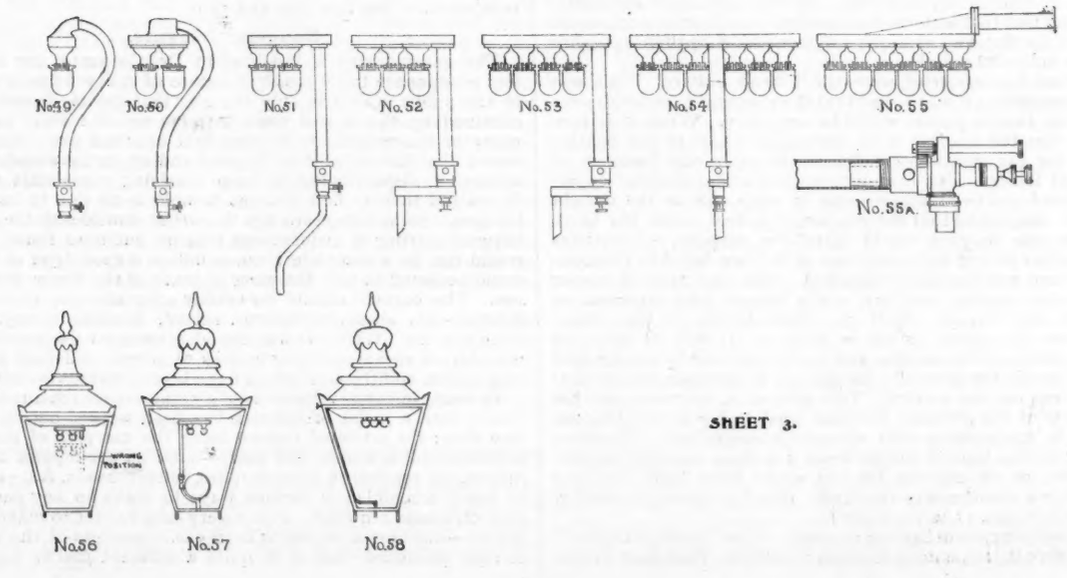
To assist in the development of a maintenance scheme at some future date, a series of burners has been worked-out on rather new lines; the principal feature being the carrying of stocks of interchangeable component parts—such as gas-nipples and adjusters, air regulators, bunsen tubes, burner heads, &c.—capable of being assembled in various ways to make up any particular type of burner required. It is a very easy matter to make a gas-burner—meaning a burner to burn gas, regardless of the amount of light produced—but it is quite a different matter making a



SHEET 1.

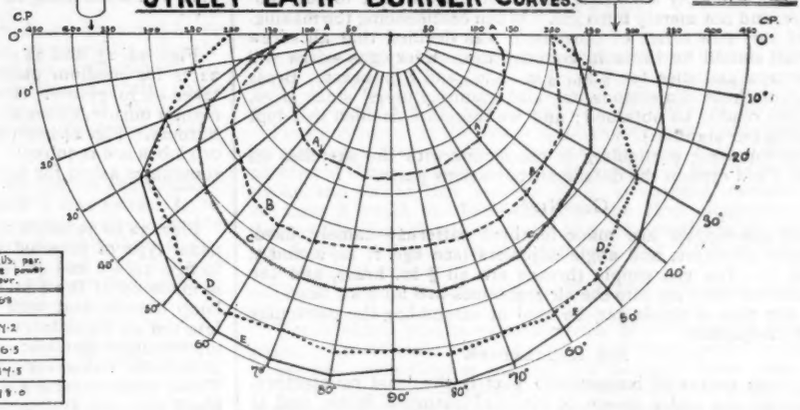


SHEET 2.



SHEET 3.

STREET LAMP BURNER CURVES. No.1



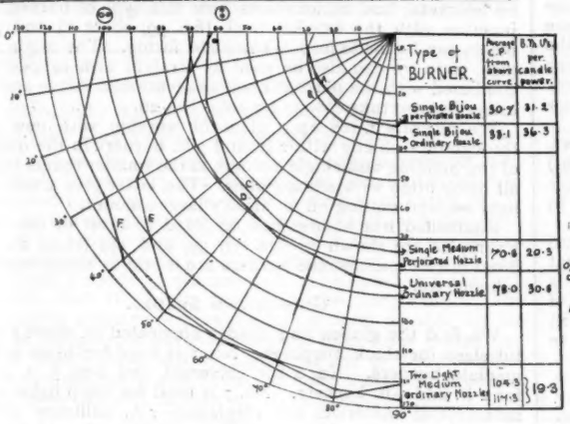
Curve.	Type of Burner.	Average c.p. per hour from both sides of above curve.	B.Th.Us. per candle power hour.
A	Two Light oval Sheffield No. 51	132·5	16·9
B	Three " " No. 52	240·0	17·2
C	Four " " No. 53	349·8	16·5
D	Six Light Circular Cluster	348·0	17·5
E	Six Light oval No. 54	347·5	18·0

CONVERSION FACTORS.

$\frac{100{,}000}{\text{B.Th.Us. per candle hour}}$ = Candle hours per Therm.

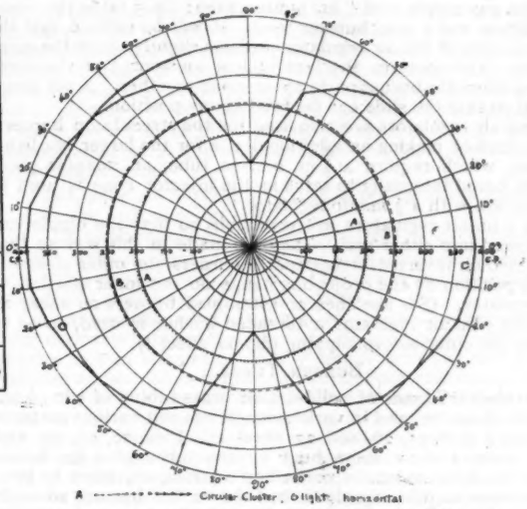
$\frac{\text{Calorific Value of Gas (peach)}}{\text{B.Th.U's per candle hour}}$ = Candle hours per c.ft

DOMESTIC BURNER CURVES No 2.



Type of BURNER.	Average C.P. from above curve.	B.Th.Us. per candle power.
Single Bijou Perforated Nozzle	50·7	31·2
Single Bijou Ordinary Nozzle	53·1	36·3
Single Medium Perforated Nozzle	70·8	20·3
Universal Ordinary Nozzle	78·0	30·8
Two Light Medium Ordinary Nozzle	104·3 / 114·3	19·3

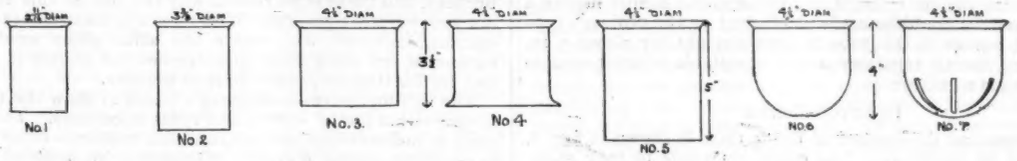
No. 3.



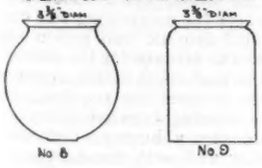
A ---------- Circular Cluster, 6 light horizontal
B ---------- " " " 15° below horizontal
C ———— Oval Burner 6 light horizontal

SHEET 4.

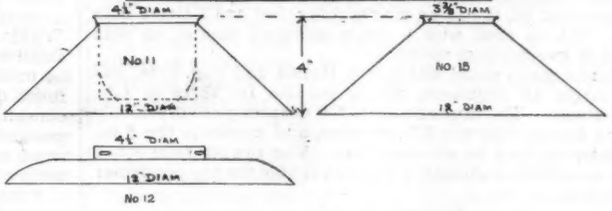
SILICA WARE



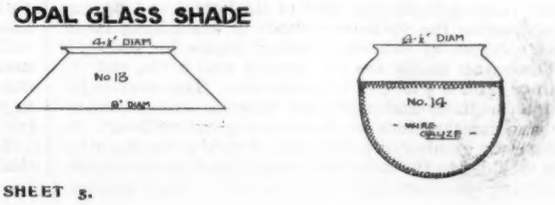
CLEAR H-R. GLASS



ENAMELLED IRON SHADES



OPAL GLASS SHADE



SHEET 5.

burner to give a really good light with a small consumption of gas. The main point we have kept before us in making these burners has been to supply an article which will deliver light to the consumer, and not merely burn gas. When commencing the making-up of this new series of burners, it was decided that all screw threads should be those in common use. Every gas-works will have taps and dies for $\frac{3}{8}$ in., $\frac{1}{2}$ in., $\frac{5}{8}$ in., and $\frac{3}{4}$ in. brass. Brass tubes of these dimensions are also manufacturers' stock sizes, and can readily be obtained; and we therefore decided to adopt these as our standard.

The following particulars in connection with the sketches on sheet 1 will explain the details of the various parts.

Gas-Nipples.

The gas-nipples are made in three patterns—namely, fixed, straight adjusters, and angle adjusters (see figs. 1, 1a, 2, and 3, sheet 1). The gas supply threads are all $\frac{3}{8}$ in. brass, and the threads for screwing into the air regulators are all $\frac{1}{2}$ in. brass, so that any type of nipple can be used in assembling the particular burner required.

Air Regulators.

In most makes of burners this part is the least satisfactory. Generally the outer sleeve is made of stamped brass, and is usually either too loose or too tight, and after being in use for a short time becomes corroded and unworkable. To ensure a good sliding fit and to overcome the difficulty due to sticking, the new air chambers are turned out of the solid (see figs. 4 and 5, sheet 1). These are admittedly more expensive than the usual type; but as the object was to make a substantial article, as free from defect as possible, the first cost is only a minor matter and a saving in the end.

The regulators are made in two sizes. Fig. 4 is made to take the $\frac{1}{2}$ in. gas-nipple and $\frac{1}{2}$ in. bunsen tube; fig. 5 takes the same size nipple and a $\frac{5}{8}$ in. bunsen tube. It will be noticed that the inner portion of the air regulator projects slightly above the outer portion. This ensures the free sliding movement of the outer portion when the burner parts are screwed together. A set screw is fixed so that the slide can be fixed in any position.

These air regulators are also used for the street-lamp burners, and instead of making an additional size for the larger (six-light) burners, which require a $\frac{3}{4}$ in. bunsen tube, an adapter piece (fig. 8b) bored internally to serve as the injector cone is used in conjunction with a $\frac{5}{8}$ in. air regulator.

The $\frac{1}{2}$ in. air regulators are reversible, so that the nipple can be screwed into either end. They are made in this way so that when fixed on inverted or horizontal burners the outer sleeve is kept in position by the projecting flange on the inner portion of the regulator. (See sketches of assembled burners on sheet 2.) With the $\frac{5}{8}$ in. air regulator a threaded washer is used, so as to prevent the outer sleeve slipping (fig. 6o, sheet 1).

Bunsen Tubes.

The tubes are made of solid-drawn brass tubing of $\frac{1}{2}$ in., $\frac{5}{8}$ in., and $\frac{3}{4}$ in. diameter, and in various lengths to suit various patterns of burners (figs. 25, 26, and 27, sheet 1). Figs. 28, 29, 30, and 31 on sheet 1 show some bent bunsen tubes of $\frac{1}{2}$ in. brass. At the commencement the writer had a strong objection to bent bunsen tubes, as past experience had shown that burners so made were usually inefficient as regards light obtained, the poor results being due to the improper aeration of the flame. It was found, however, that in many cases the only pattern of burner which could be fitted to existing brackets and pendants, without being clumsy in appearance, was some form of bent tube or swan-neck burner. After various trials, it was found that a burner having a bent bunsen tube could be made as efficient as the ordinary type of inverted burner if the tube is kept straight for about 3 in. after leaving the air regulator, and if a suitable injector cone is fitted in the air regulator.

Injector Cones.

These cones and the method of fitting them is shown in figs. 8, 8a, 8b, and 8c (sheet 1). The cones are made in four sizes. The first is threaded $\frac{1}{2}$ in. brass to fit the $\frac{1}{2}$ in. air regulator, and has an internal bore of $\frac{7}{32}$ in. It is used with single bijou or intermediate mantles. The second size has the same external dimensions and fits the same air regulator, but has a larger bore —$\frac{9}{32}$ in. This is used with a single universal mantle, or with two bijou or two medium mantles.

The third cone is made with a $\frac{5}{8}$ in. thread and $\frac{3}{8}$ in. bore, and fits the larger air regulator, and is suitable for three or four mantle burners. The largest cone is the adapter piece previously mentioned for use with the 6 lt. burners, and connects the $\frac{3}{4}$ in. bunsen tubes to the $\frac{5}{8}$ in. air regulators. The use of these cones makes it possible to construct a burner suitable for any particular quality of gas.

Burner Heads.

Figs. 9 to 14 (sheet 1) show the various burner heads for street-lamp burners ranging from one light to six lights, and figs. 49 to 55 (sheet 3) show the various methods of assembling these. Figs. 15 to 21 (sheet 1) illustrate burner heads for domestic burners. The burner heads are all made of cast brass, and the thread for the nozzle is $\frac{3}{4}$ in. gas in each case. The nozzles for the bijou, intermediate, and universal mantles are all interchangeable, and can therefore be fitted to any burner head. In order to reduce the number of parts, a globe carrier for the bijou size was not included in the series, as it was found that the intermediate globe had a good appearance when the burner was fitted with a bijou mantle. The universal globe holder and globe also look well when using intermediate mantles instead of universal.

Globe Holders.

Figs. 22, 23, and 24 show the three sizes of globe holders. Fig. 22 is for medium glass ware; fig. 23 for universal; and fig. 24 takes $4\frac{1}{2}$ in. globes. The first two can be used on any single-mantle burner, either inverted, angle, upright, inverted, or bracket burners. Fig. 24 is used for all 2-lt. and 3-lt. burners when shades or globes are required. For workshop use, the angle burners are sometimes asked for without the globe holder.

Assembled Burners.

Figs. 32 to 39 (sheet 2) require no special mention; they are the usual type of inverted and angle burners. The burner shown in figs. 44, 45, and 46 (sheet 2) has proved a useful pattern. It is made up of the $\frac{1}{2}$ in. swan neck tube belonging to the street-lamp burner, and with $\frac{7}{32}$ in. bore injector cone (fig. 8) fitted into the air regulator, will give a good keen flame for bijou and intermediate mantles; while injector 8 A ($\frac{9}{32}$ in. bore) cone gives a suitable flame for universal or two intermediate mantles. These burners form a useful bracket when mounted on pattrass block with tap and back plate (see fig. 46, sheet 2), and have the advantage that the regulation is well away from the heat; also the burner as a whole keeps cleaner for a longer period than do other types. When fitted to the pendant body as shown on sheet 2, the effect is simple and graceful.

Fig. 48 (sheet 2) is a useful burner for mounting on wall brackets. When a 5 in. vitreosil globe is added, only a small portion of the burner stem remains visible.

Figs. 40, 41, and 42 also show a useful type of burner for fixing on brackets; and fig. 40 shows how this type of burner, in conjunction with the bracket back (fig. 59, sheet 1) and pattrass block, can be made into a complete fitting. The angle burners (figs. 36 to 39) can also be used as straight arm brackets, when combined with the bracket back as mentioned above and substituting bunsen tube No. 27 for tube No. 26.

We recently fitted up a place of worship with new burners throughout—chiefly with 2-lt. and 3-lt. burners in the main body of the building and single burners in the smaller rooms adjoining; all being fitted with silica globes. The latter give a soft diffused light without cutting-off an unduly large amount.

Enamelled iron shades can be fitted to most of the burners. Examples are shown in figs. 37, 39, and 34a (sheet 2). When fitted in this manner, the burners are useful in shops, workshops, schools, &c.

Globes and Shades.

We find the globes and shades illustrated on sheet 5 are useful sizes for stock purposes. No. 1 is used for bijou and intermediate burners. No. 2 for universal, and Nos. 3, 4, 5, and 6 for 2-lt. and 3-lt. burners. No. 7 is used for shop lighting where inflammable materials are displayed—*e.g.*, millinery establishments. It is a rare occurrence for a mantle ring to break and fall; but this pattern globe avoids any danger from that cause. Figs. 11 and 12 show two patterns of enamelled iron shades for the 2-lt. and 3-lt. burners. Fig. 13 is opal glass; and fig. 14 shows the wire-cage type of globe in $4\frac{1}{2}$ in. fitting. Fig. 15 represents the enamelled iron shade for the universal fitting. The adoption of burners requiring larger globes and shades than the universal size has been retarded in the past, owing to these larger ($4\frac{1}{2}$ in.) sizes not being in general use for domestic purposes. The $4\frac{1}{2}$ in. globes, &c., are already used by several makers for their larger burners, and there is no reason why the use of this size should not become more general. With regard to clear globes for shops, schools, factories, &c., where the silica globe would be too expensive, we stock clear glass globes (as shown in figs. 8, 9, and 10) for their respective sizes of burners.

The lighting curves in diagram 2 (sheet 4) show the results obtained with a few of the various types of burners. These curves seem to indicate that the intermediate mantles—either singly or in multiple—enable a greater efficiency to be obtained than with the universal mantle.

The making of this series was commenced in a small way; the brass castings for the burner heads being made locally and finished at our own works, where the assembling was carried out. Within twelve months the local demand had grown beyond our small means; and we have had to arrange for the burner parts to be made elsewhere. As to the usefulness of the series, we have found it possible in every case to meet the requirements of the consumer, and in the case of existing internal fittings—such as pendants, brackets, &c.—to design a burner which will be efficient, and will also harmonize well with these fittings without being obtrusive.

A method of fitting I personally do not like is the $\frac{3}{8}$ in. swan-neck tube and inverted burner attached to a bracket or pendant. As generally made, this fitting looks what it really is—a make-shift. The only exception the writer is aware of is the well-finished swan-neck fitted to the "Metro" burners.

The introduction of these new burners into any part of our area has quickly resulted in an influx of orders, showing that the consumers appreciate the much better light given with the same or a lower consumption of gas. Further, the installation of electricity has been checked in not a few cases.

To make this paper as brief as possible, the writer has intentionally omitted several points; but these may arise in discussion.

It may be added that the quality of gas we supply is 450 B.Th.U., and that the burners have been tried on gases ranging from 400 to 550 B.Th.U., and found satisfactory.

All the combinations which can be made up have not been described. As a matter of fact, we can fit up over fifty different combinations with our stock parts. The object of this paper is to show the means adopted to meet the competition in lighting; and if this will stimulate the interest of other engineers in this branch of the industry, the writer will feel that his efforts have been amply repaid.

An interesting discussion followed, and Mr. Barnes was cordially thanked for his paper. The President said it was refreshing to find one of the members dealing so fully with this matter of lights and burners. They were generally content to leave these things to the makers of appliances; but Mr. Barnes had gone into the matter thoroughly, and was to be congratulated on the ingenuity he had shown in arranging so many different parts one with another. Messrs. W. B. M'Lusky (Halifax), W. M. Carr (Stretford), W. Buckley (Manchester), F. H. Robinson (Harrogate), W. J. Smith (Bolton), F. G. Shaw (Buxton), W. Whatmough (Heywood), A. E. Mottram (Ossett), J. H. Brearley (Southport), F. J. Belton (Macclesfield), and S. Shadbolt (Southbank) joined in comment upon the points put forward by Mr. Barnes. General agreement was expressed with him in his submissions—particularly as to the folly of trusting to "cheap and nasty" incandescent burners, and as to the wisdom of letting gas engineers have a free hand in the methods they adopt to develop the industry. The interference of committees in this respect, in the interest of plumbers, or of electricity, was condemned. By proper attention to burners and their maintenance, there was no question that many a check might be given to electricity, and gas retain its lighting load.

Smethwick Corporation Gas Bill.

An "after-time" Bill has been introduced into Parliament by the Smethwick Corporation. The preamble states that the demand for gas in the borough has of recent years increased, and is still greatly increasing; and therefore the Corporation desire to be authorized to acquire and use land described in Part I. of the schedule to the measure, and on such land and land described in Part II. to construct additional works for the storage of gas. The land referred to in Part I. is the property of Tangyes, Ltd., and contains 3 roods 37 perches and 19 sq. yds., and the land described in Part II. already belongs to the Corporation. The clauses confer power to acquire the former land, provide for the powers of compulsory purchase to cease after three years if not exercised before then, and authorize the use of the described land for the storage of gas, coke, and other secondary products. [*Parliamentary Agents: Messrs. R. W. Cooper & Sons.*]

Horizontal Retorting.

A booklet bearing the title of "Something New and Something Due to Horizontal Retorting" has been forwarded to us by Messrs. Robert Dempster and Sons, Ltd., of Elland, Yorkshire. This publication has been prepared with the great care which characterizes the workmanship of this widely-known firm. It is pointed out that just as revolution does not mean progress, so no drastic change underlies their improvements in the manufacture of horizontal retort-settings. Their present product is the result of gradual development and the expenditure of infinite pains. Every detail of the setting has been subjected not only to the searching criticism of experimental investigation, but also to the proving test of time. Lavishly illustrated, the booklet deals with the producer, the gas-tight furnace charging-door, the employment of silica and siliceous retorts, an improved method of insulating the setting, and the vertical-tubular regenerator setting, and finally gives a number of photographs of the well-known works of the firm at Elland.

Business Building.

We have received from Sir Isaac Pitman and Sons, Ltd., of Parker Street, Kingsway, W.C. 2, Part II. of their new publication, "Business Building." In Part I. the subject of exterior and interior lighting was dealt with; and in this book is a contribution upon the question of industrial heating and ventilation. In this connection, the use of gas figures largely. The writer points out the many advantages accruing from the employment of gas as a heating medium. Regarding the gas-fire he states that "it is a very efficient dispenser of radiant heat. This is a point to be noted, because we are authoritatively informed that radiant heat is the ideal." After reviewing in turn the gas radiator, the gas-steam radiator, and the condensing stove, the article emphasizes the importance of gas, and mentions that there is hardly a modern industry to-day which does not use gas for some heating process. A sign of the times on this point is the fact that a large modern building in the heart of the City of London has been designed to carry gas-pipes to every room in the building, in order that gas-heaters may be installed at every required point. Dealing with electric heating, the writer states that the difficulty to progress is the high cost of the current, and it is hard to see how there is to be any considerable reduction in the near future.

LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.

A well-attended Meeting of the Association was held on Feb. 23 at the Westminster Technical Institute, Vincent Square, S.W.—Mr. D. CLEAVE CROSS (Lea Bridge), the President, in the chair.

The PRESIDENT, at the outset of the proceedings, remarked that he was sure they would all be sorry to hear that a very old member of the Association, Mr. F. Ainsworth, of Ilford, had had a stroke, and was at that moment lying in hospital unconscious. He knew it would be their wish that the Hon. Secretary (Mr. George Winslow) should convey to Mrs. Ainsworth and the family the deepest sympathy of the members, and the hope that the patient might recover.

Those present unanimously signified their agreement with this proposal.

The President said he would now ask Mr. Warren to read his paper. Mr. Warren had long been associated with the retort-house, and carbonization was his pet hobby. Some time ago, he read a paper on Congdon pipes before one of the Senior Associations; and now he had come to favour them with a contribution on a subject which he knew inside and out.

RETORT VACUUM AND QUALITY CONTROL.

By W. H. WARREN, Assistant Engineer at the Shoreditch Works of the Gas Light and Coke Company.

From a commercial point of view, efficient carbonization consists in obtaining from coal the maximum value of saleable products with the minimum working expenditure.

A gas company's statutory obligation to maintain a supply of gas has resulted in the evolution of carbonizing plant designed to produce the maximum gaseous thermal value by destructive distillation of coal; the liquid and solid products being given secondary consideration. This policy would appear the most profitable one in existing normal conditions of markets. It is, at any rate, a policy which most of us are called upon to fulfil. Thus, in carbonization as it is practised, there are two points of paramount importance—

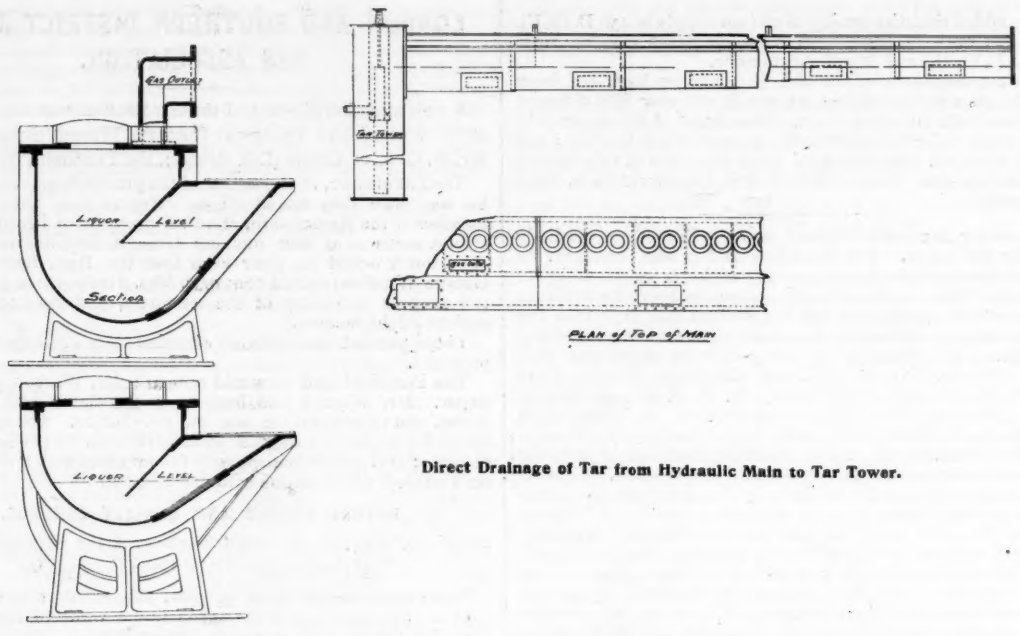
1. The complete burning-off of the largest possible charge per cubic foot of retort space.
2. The means employed to remove the gas from the retort.

These are the cardinal considerations upon which efficiency in carbonization depends, and it is with the second of these considerations that I propose to deal in this paper.

Let us consider what condition of vacuum or pressure it is most desirable to maintain in a retort. Several hoary superstitions survive in this connection; many people believing that a slight vacuum assists carbonization, others that pressure causes (or prevents) stopped pipes and the deposition of scurf. When we have realized that the charge in every retort is under the barometric pressure of some 28 ft. of water, and is subject to barometric variations of the order of 24 in., we become suspicious of the reality of the alleged benefits, or disadvantages, obtained by varying this pressure by a few tenths of an inch. We may confidently assume that, apart from causing leakage into or out of the retort, the effect of slight vacuum or pressure during carbonization is negligible. It therefore becomes obvious that the gas in the retort should be under barometric pressure in order to avoid leakage, either of gas from the retort, or of inerts into the gas. It is particularly important to avoid the latter condition, it being easily understood that this effect will be cumulative, the retort becoming increasingly porous as the particles of carbon in its structure are burnt away. I ask those who resent the insinuation that their retorts are not gas-tight, to test them by increasing the normal vacuum by 1 in. When we have attained to the really gas-tight retort, we may be able to work at a vacuum of several inches of mercury, and avoid the necessity of such high temperatures as we now use. In such retorts as are at present obtainable, we shall do well to maintain barometric pressure—*i.e.*, a level gauge—during the whole period of carbonization. In order to attain this ideal condition, the whole of the apparatus between the retort and the outlet of the house must be of correct design; and it is my intention to consider each portion in turn, having in view the desirability of maintaining a level gauge in the retorts. I would repeat that this condition is an ideal one. I do not know of any existing retort-house where it obtains.

THE ASCENSION PIPES.

The ascension pipes should be as large as is practicable, and should be kept clean. For these reasons, it would seem advisable to have only one pipe per retort. It is usually possible to obtain superior capacity where one only is fitted. It may be argued that where full charges are used and are liable to block the retort, two pipes are essential. This is not my opinion. A level charge is unlikely to block at one point only, and although the second pipe may relieve a leaky lid of pressure, and reassure the observer, it does not follow that all is well within the retort. I do not deny that the blocking of charges is a serious fault, but insist merely that the cause should be discovered and eliminated, instead of the effect being hidden. With further regard to the cleaning of ascension pipes, I would lay stress on the statement that they should be kept absolutely free from deposit. The possibility of keeping them in this condition depends, in my experience, largely



Direct Drainage of Tar from Hydraulic Main to Tar Tower.

upon the size and type of the charge employed. I know of one case where the pipes are easily kept clean by trying every forty-eight hours, and of another where they become stopped during the eight-hour period of carbonization. In the first case the retorts are nearly filled; and in the second instance they are only filled to about one-third of their cubical capacity. It is advantageous to have representative ascension pipes fitted with gauge cocks, which are least likely to block and easiest to clear if fitted into the cap. The cap of the ascension and dip pipes should be preferably of the self-sealing type, for reasons which will be explained more fully later.

The Dip Pipes.

Little consideration is needed to show that it is not possible to obtain a level gauge in the retort if we seal the dips in the conventional manner. The wash of liquor in the hydraulic main will cause an oscillation which will result in leakage—both of gas and inerts. Even if we are able to construct and fix the main so as to overcome this, and the irregularities of seal caused by the expansion and contraction of the setting (no mean achievement), the result will still not be ideal. The rate of evolution of gas from a charge varies considerably during the carbonization period, and the consequent variation in the liquor displaced by the bubble of gas issuing from the dip causes (even with the lightest possible seal) a considerable variation in the retort vacuum. With unsealed dips, these objectionable features do not obtain, and there is the added advantage that the retorts, whatever the period of carbonization may be, are all under the same pressure or vacuum condition, some compensating for the others. This is only so, of course, if the ascension pipes are of sufficient capacity.

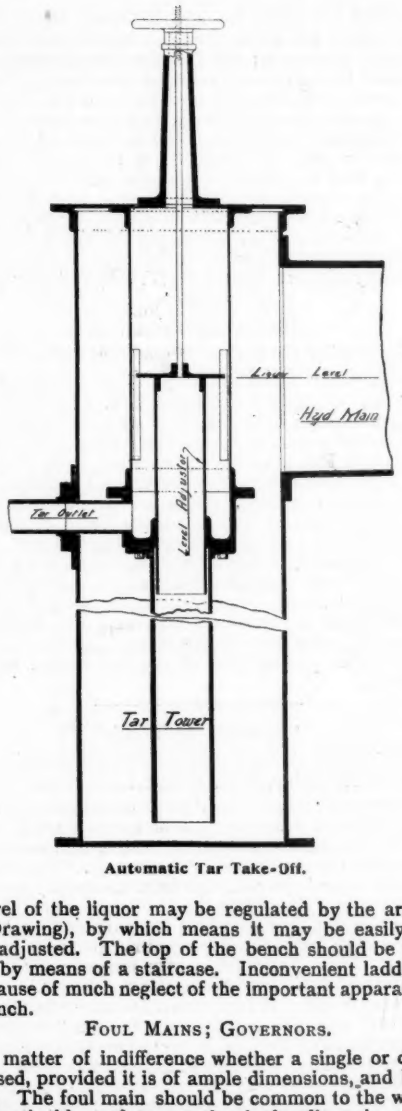
An American invention, the Congdon stand-pipe, which is in effect an ascension pipe common to a number of retorts, possesses this property of vacuum compensation, and it is astonishing how low the inerts may be kept, without loss of gas, when this device is in use. With separate ascension pipes, however, where the dips are not sealed, it will be found advantageous to use some form of anti-dip when the retorts are opened for charging. Without some such device it is difficult to charge without loss of gas and the introduction of air, owing to convection effects which cause gas to be expelled from one pipe, while its immediate neighbour is drawing air.

Hydraulic Main.

The correct functioning of the hydraulic main is a vital factor in securing proper conditions of retort vacuum. The maintenance of the desired liquor-level in the mains is equally necessary, whether sealed or unsealed dips are in use; and the method of drawing-off the make of tar and liquor is all important in this respect, as well as with regard to the quality of the tar made. Considerable experience with external tar mains, both of large and small diameter, has led me to dislike them; I would use instead a hydraulic main with a bottom falling generously towards the tar tower, to which the end of it is bolted. (Drawing.)

The use of self-sealing caps for the ascension and dip pipes may here be explained. Most of the blockages occurring in retort-house tar-mains are aggravated, if not actually primarily caused, by the jointing material from the caps falling into the hydraulic main, although it seems impossible to get the men concerned to understand this. Where no "pug" is used, no trouble can result from it. The hydraulic main should be provided with sealed cleaning-out doors, through which the internal condition of the main may be inspected, and kept in order. The gas should be led off from the top of the hydraulic main, and the make of virgin liquor will then be sufficient to maintain the desired level, without circulation, the addition of water, or other device.

The tar should be taken away continuously from the tower by means of the device illustrated, the action of which depends on the difference of specific gravity between the tar and liquor. (Drawing.)



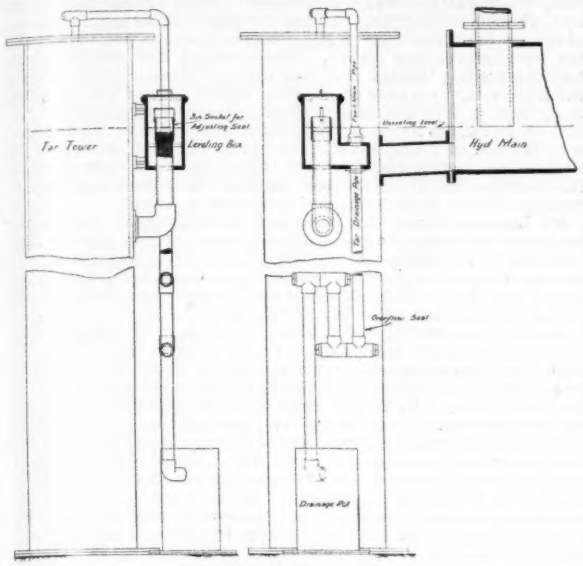
Automatic Tar Take-Off.

The level of the liquor may be regulated by the arrangement shown (Drawing), by which means it may be easily and with certainty adjusted. The top of the bench should be made easy of access by means of a staircase. Inconvenient ladders are the indirect cause of much neglect of the important apparatus located on the bench.

Foul Mains; Governors.

It is a matter of indifference whether a single or double foul main is used, provided it is of ample dimensions, and laid with a good fall. The foul main should be common to the whole house where practicable, valves on the hydraulic-main connections being relied on to shut off sections of the work when desired. In large houses it may be desirable to graduate the size of the foul

main, the maximum diameter obtaining at the inlet of the retort-house governor. Very large houses, of over 12,000 therms output per diem, should be designed as multiples of this unit system.



Seal Regulating Box.

If the foul main is correctly designed (that is, so that the pressure thrown by it at normal make is negligible) only one retort-house governor is necessary. This makes for simplicity and cheapness. Large governors are more efficient than small ones, and one large governor is far easier to adjust, and more likely to get adjusted, than a number of small ones. Also, a single governor, on the outlet of the foul main, may be placed in a suitable and accessible position, where it can receive care and attention, while a number of small governors must of necessity be placed in heat and dirt, and difficult of access on top of the beds. In some cases the retort-house governor may with advantage be placed in the exhauster-house, on the inlet to the exhauster; the usual steam-throttle governor being retained.

GAUGES.

When unsealed working is resorted to, the importance of minute alterations in the retort vacuum at once becomes apparent. The ordinary type of U-tube water gauge is too crude an instrument to show variations of the order of 0·02 in. (the maximum variation which should be allowed), and is not indeed capable of indicating with any accuracy variations of less than 0·1 in. The single-leg type water gauge, being almost full scale, and easier to read, is more suitable for our purpose; but evaporation affects its accuracy, and although a film of oil on the surface of the water is helpful, frequent checking (on open service) is necessary. For the main gauges at each extremity of the foul main, recording gauges of the aneroid type are desirable. These can be obtained to read in 50ths of an inch, to 2·10ths pressure and 5·10ths vacuum. When in use they should be checked and adjusted frequently (at least daily). A water-gauge may be placed on each section of hydraulic main, a long service being avoided. If the engineer has a desire for multiplicity of gauges, he may most profitably use them on the ascension pipes. A portable aneroid type recorder is a very useful fitment if intelligently used.

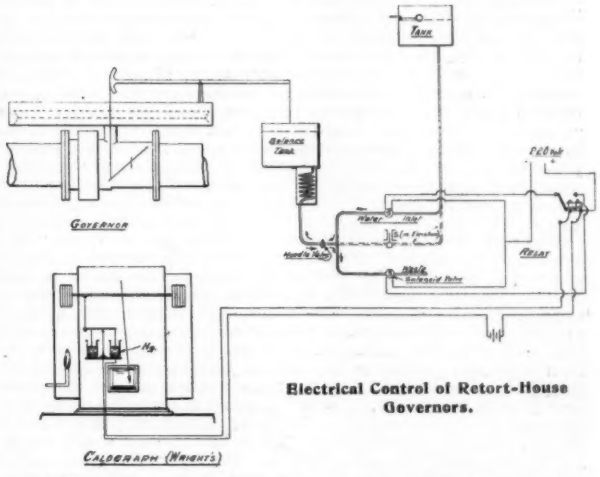
I have postulated that it is desirable to maintain a constant pressure in the retort during the whole period of carbonization, and therefore in all the retorts simultaneously, and that this pressure should be atmospheric pressure. I have also outlined the design for suitable plant with which this end may be attained.

In most existing retort-houses there is little hope of the ideal condition being secured, the chief stumbling-block being the design of the ascension pipes. It is usually possible to maintain any desired constant vacuum in the hydraulic main—indeed, considerable attention has been given to this problem, while the condition in the retort (all that really matters) has been allowed to look after itself. The rate of evolution of gas during carbonization varies enormously, and with it varies the pressure thrown by the ascension pipe. Thus (unless the ascension pipe is so large in capacity or so short that the pressure thrown on full make is negligible) considerable variation of pressure condition will take place in the retort even when the condition in the hydraulic main is constant. In extreme cases this variation may amount to 1 in. water-gauge. So general is this defect in design, that it has become customary to accept it as inevitable, and a compromise is adopted in working the plant. The condition which is the more obviously detrimental to economical carbonization—that of positive pressure in the retort during the period of maximum make—is provided against by working sufficient vacuum on the hydraulic main to overcome it.

The resulting vacuum in all the other retorts has, of course, led to the objectionable result of introducing inerts into the gas. Even where considerable efforts are made to improve the gas-tightness of retorts and lids, coal gas cannot be manufactured economically with an inert content of much less than 12 p.ct. It is obvious that the introduction of inerts into coal gas, in whatever proportion, is a sheer waste of money, granted existing normal market conditions; and it is sound policy to keep the inerts as low as possible, having due regard to the thermal losses which will occur by reason of the positive pressure on the retorts which are at the period of maximum make. A convenient method of working is to endeavour to maintain a constant quality, having first ascertained the highest quality which can be economically produced with the plant available. The latter is best decided by intelligent use of the ascension pipe gauges referred to above, confirmed by working results over considerable periods; any variation from this standard quality is accompanied by waste. A constant quality can only be maintained in most retort-houses by means of considerable variation of the hydraulic-main vacuum.

Differences of temperature of the various tiers of retorts, variations in the speed of charging, stokers' meal times, changes of shift, changes of coal, and mechanical breakdowns, are a few of the causes which affect quality even in the best-regulated retort-houses; and the hydraulic-main vacuum must be altered accordingly. Easy manipulation of the retort-house governor is therefore desirable, and, if the apparatus is in an inaccessible position, can be achieved by means of water-loading, the cocks being operated from the charging stage.

I have not found any instrument more serviceable as a primary indicator of change in quality, than the ancient jet photometer. But whatever instrument is used, it should be connected, by as short and small a service as possible, to the exhauster outlet; the service being continued past the instrument to burners. If placed in the exhauster-house, it should be housed as a safety measure in a gauze-ventilated metal case. The indications should be read frequently, and the results transmitted to the man responsible for the retort-house vacuum, usually the foreman or the chief pipe-jumper. When the exhauster-house is a long way from the retort-house, the indications may be electrically transmitted as sound or light signals. I believe illuminated signs are in use at Beckton. The various causes of variation of quality are not likely to be of similar duration, and there is the lag of the indicating instrument to be reckoned with, so that the person chosen to adjust the governors must be intelligent. Such a system of quality control, however well it may be organized, cannot be considered more than a clumsy makeshift. The intervals between the corrections of vacuum cannot conveniently be less than thirty minutes, and results are influenced far too much by the human element. Considerable variations in quality may be expected to occur when such a system of control is in use. I would therefore suggest the



Electrical Control of Retort-House Governors.

employment of an automatic system of control which could be arranged somewhat on the following lines. Adjustable mercury contacts attached to either side of the beam of a Wright's calorgraph (connected to the outlet of the exhauster) operate relays, which are used to load and unload the retort-house governor with water. With such a system of control it should be possible, whatever the description of plant in use, to produce gas of the quality which it has previously been found can be produced most economically with the plant in question.

The paper was illustrated by a series of lantern slides, and was followed by a very full and interesting discussion, some points from which are given below.

DISCUSSION.

THE PRESIDENT, in opening the discussion, said they had had a very valuable paper, full of ideals. It pictured what, in the author's view, a retort-house should be. He started with the important pronouncement that "efficient carbonization consists in obtaining from coal the maximum value of saleable products with the minimum working expenditure;" and he concluded with the equally important statement that, with the system of control outlined, it should be possible, whatever the description of plant in use, to produce gas of the

quality which it had previously been found can be produced most economically with the plant in question. These two points summed-up the whole matter of carbonization. It was extraordinary that, with such knowledge as was possessed at the present day, there should be so wide a difference of opinion as was noticeable among leading gas engineers with regard to the first phrase. One would concentrate upon a high gas yield, while another would believe in not prejudicing the bye-products. There was a great difference with the various types of plant in the economical quality of gas to produce. At Vauxhall they saw them making gas of 560 B.Th.U., which was stated to be their economical quality. But he thought if one attempted to make this quality on verticals, one might lose very badly. With verticals, it seemed to him, something in the region of 500 B.Th.U. was better. Of course, the paper dealt with horizontals. Although full charges had cured stopped pipes with horizontals, with inclined retorts they still had this trouble. In this case, using varying qualities of coal, it was very difficult to get full charges. The vertical retort, he supposed, was ideal, from the point of view that it was always fully charged. He liked the author's hydraulic main; but there was one point with which he did not quite agree—this was the absence of liquor flow. Personally, he preferred to see liquor going in and helping things. With inclined retorts, they had to maintain good liquor circulation. The jet photometer was mentioned in the paper. Though it might be old-fashioned, this was an excellent thing for the retort-house foreman. With it he could watch his quality very closely. Wright's calorgraph was very sensitive to barometric variations and changes of temperature.

Mr. W. GROGONO (Gas Light and Coke Company) also referred to the jet photometer, and remarked that he had come across many cases in which this had been discarded and some other form of apparatus put in; but he did not know of a single instance in which the jet had been removed. Congdon pipes, he thought, were very nice in theory. He had them for a short time in practice, and did not care for them. They gave rise to all sorts of troubles. He had not, however, had a whole house fitted up with these pipes; and, probably, under those conditions they would work much better. The author said he disliked external tar mains, and so did he (the speaker). The tar, with the gas they were making at the present moment, was very thick stuff, and by doing away with tar mains they would remove one great trouble. Reference was made in the paper to an automatic tar tower, which was excellent. There were many of them working very successfully. The device was really the outcome of years of investigation; and he thought Mr. Warren was the pioneer.

Mr. W. NEWTON BOOTH (Woolwich Arsenal) said all the trouble taken to regulate vacuum was caused because the retorts were not tight. The paper dealt with the ideal; but they had to come down from the skies to ordinary refractory materials, and these were not by any means tight. When the matter was considered carefully, it would be realized that, if one intended to maintain the same pressure inside and outside the retort, there was a most intricate problem to be solved —especially in the case of settings containing a number of tiers of retorts. Having experienced a lot of trouble with equilibrium pipes, he gave much thought to the matter, and had devised a successful method of working the ordinary Dillamore towers without equilibrium pipes. The ordinary arrangement of equilibrium pipe was liable to give trouble by a tendency to block-up, when it became impossible to regulate the seal, and there was considerable risk of syphoning-off all the liquor in the mains. Even when the arrangement was working properly, it was difficult to have very light seals with any certainty of not "pulling" on occasions. It occurred to him that if the liquor in the tower was exposed to atmospheric pressure, and the overflow weir adjusted so as to be level with the bottoms of the dip pipes, the "seal" would be governed by the foul main vacuum, and that consequently it would be safe to work with very light seals and low foul main pulls. The equilibrium pipe was accordingly cut, and a cock inserted; a similar cock was placed on the tower giving access to the air. This allowed of the ordinary conditions being rapidly restored in case of emergency, and obviated the risk of emptying the mains in case of exhauster stoppage. The apparatus, as altered, had been at work over twelve months. The mains were worked with a liquor circulation; and it had proved possible to run consistently with a foul main pull as low as 3-10ths, or even less, if necessary. There had been a marked increase in the thermal yield per ton of coal, and a diminution in trouble in the retort-house, though most of the retorts were of considerable age. It had to be realized that this arrangement did away with the possibility of exhauster control of quality; and if the pull required adjustment, this had to be done on the weir valves. But he had found this advantageous. The slight pressure on a bed when first charged automatically lowered its seal; and the arrangement had proved to require very little attention, and to be practically self-governing.

Mr. F. A. FROST (South Metropolitan Gas Company) pointed out that the comprehensive character of Mr. Warren's paper was another intimation to them that the conditions necessary for successfully operating carbonizing plant were no longer what they used to be. Apart from the other advantages of the new system of selling gas and expressing all their results in therms, a man did now know exactly where he stood in relation to other people; and it was his opinion that many of those who were once claiming 13,000 to 14,000 c.ft. per ton had fallen from their pinnacle, and had come down to the level of others who were content to make 12,000 c.ft. at that time. While he agreed that one ascension pipe to a retort might be an advantage in some respects, he was inclined to think that two pipes were preferable. What he had in mind was the effect of the travel of the gas along (say) a 20-ft. retort. This raised the question of degradation. A certain amount of degradation of the gas evolved from the coal was necessary in order to produce the quality of gas they were accustomed to supply; but he was not sure that it was not possible to over-degrade it, with the result that, though there might be an increased volume, its therm value might show that something had been lost in the process. Mr. Warren had said a good deal about unsealed dips. With regard to the experience of the South Metropolitan Company in this matter, he thought they had come to the conclusion that, whatever advantage the unsealed dip pipe might possess, the disadvantages pertaining to its use more than counterbalanced it, with the result that they had gone back to the sealed dip. In addition to receiving the gas and sealing-up the dip pipe, the hydraulic main performed another function, which was not always understood. What he had noticed was that, although in bubbling through the slight liquor seal the contact of the gas was exceedingly small, it was sufficient to arrest practically the whole of the free carbon. With unsealed dips, one found this carbon travelling forward and depositing all along to the exhausters, and thus laying-up a store of trouble. Again, he was not altogether in agreement with the author about governor arrangements. Personally, he did not like a large governor; and he did not care to have it at the end of a long main. The nearer the governor was to the work it had to perform, the better would be the results obtained. His Company had found the best practice was to have a governor to control a section of (say) four or five benches of retorts.

Mr. LEONARD LACEY (Gas Light and Coke Company) said he had had some experience of working a retort-house with one governor, and was inclined to believe that such was not an ideal arrangement. It seemed to him quite possible, with an instrument which would record with a fair degree of accuracy, that an arrangement like that the author last described might be made to work.

Mr. F. J. PEARCE (North Middlesex Gas Company) expressed himself in favour of two ascension pipes. He quite admitted that there might be a tendency, with two pipes, for them not to be properly looked after; but this difficulty could be overcome by supervision in the retort-house. Mr. Warren asked those who resented the insinuation that their retorts were not gas-tight to test them by increasing the normal vacuum by 1 in. Would any of them be daring enough to say that their retorts were gas-tight? He (Mr. Pearce) would not like to say that of his. His own opinion of the ideal was to endeavour as far as possible to work at a level gauge in the retorts. When retorts were being charged, they ought to be examined regularly for holes. Ascension pipes should certainly be kept free from deposits; but it was surprising to find that people would persist in using small augers for this purpose. Augers were employed which must leave at least ½ in. of scale round the pipe, which could not be cleared off. An auger of sufficient size must be used if it was desired to keep the pipes "skin clean," as the author termed it. There seemed to be a difference of opinion with regard to the necessity or otherwise of equilibrium pipes. He could not say that he cared to work without them. Working without them, he had found that the liquor from the hydraulic mains, instead of flowing over in a regular stream, had a tendency to come over in rushes, and one got the unsealed pipes which made it impossible to obtain a constant quality of gas. Most people seemed to regard the retort-house governor as an excellent thing to have; but he was working without one, and doing very much better than he ever did with it, and saving himself a lot of trouble at the same time. As to the suggested automatic control, it seemed to him that the essential part of the apparatus must of necessity be close to the governor, and retort-house governors were usually in very dirty places. For this arrangement to be a success, the real working parts must be kept scrupulously clean; and this was going to be very difficult, however closely it might be boxed-in.

Mr. E. E. CALVERT (Gas Light and Coke Company) agreed that this part of the retort-house required a great deal of care. They paid attention to the lower stage, and should go to the upper stage in order to get an increase of therms per ton. With two ascension pipes, one could probably work with a smaller pipe and a lighter auger; whereas a single pipe might have to be so large as to require an auger that could only be worked by two or three men. He noticed that at Vauxhall they had 9 in. vacuum on the outlet of the governor, but did not know whether it was any advantage to work with so big a pull as this, or whether 2 or 3 in. was sufficient.

Mr. PEARCE stated that at his works they were in the habit of using a 6¾ in. auger. The stokers did their own augering. One man opened the door, and one man did the augering usually, though the other might help him in troublesome cases.

Mr. FROST agreed that Mr. Pearce might be able to get along without a governor; but, of course, he had one retort-house to control, and a small one at that. At Vauxhall he thought 9 in. vacuum was rather on the high side, and that usually it was lower. It was well to remember that there were four retort-houses, and the exhauster-house was at one end of the works, where the gas was collected in a common stream. They needed retort-house governors where there were a number of retort-houses dotted over the place, different distances away, and where it was not possible to have a separate exhauster room for each house.

Mr. WARREN added further details in reply to the various points raised, and declared himself very grateful for the criticism offered. It was just to ascertain the opinions of others on the points referred to that he had brought his paper forward. With inclined retorts he had, of course, had trouble in getting full charges; but he did not have any difficulty with the pipes, which remained quite clean. The Congdon pipes which one speaker had alluded to as having given trouble were two sets put into a house for trial; and there might have been special reasons for any difficulty found with them. He would not like to work without an equilibrium pipe. A point had been raised about one ascension pipe possibly adding to the degradation of gas travelling the length of the retort. The main degradation took place very near the ascension pipe, where there was only one; it did not occur away from it. One ascension pipe was very much easier and cheaper to keep clean. It was not necessary for more than one man to use a 6¾ in. auger. In his case an auger was not allowed to lose more than ½ in.

The author was heartily thanked for his paper, on the proposition of Mr. GROGONO, seconded by Mr. W. T. KENSHOLE.

ANNUAL DINNER AND CONCERT.

There was a record attendance of over 150 members, ladies, and guests at the tenth annual dinner and concert, which took place last Saturday evening in the Cambridge Room at the Liverpool Street Hotel. It was a most enjoyable function in every way; and for this, acknowledgment must be made of the efforts

of the Hon. Secretary (Mr. George Winslow), the Stewards (Messrs. J. Hewett, L. Lacy, and Lloyd W. Worth), and the artistes who contributed to a first-rate programme.

The PRESIDENT (Mr. D. Cleave Cross, of Lea Bridge) occupied the chair; and he was ably supported by the other officers, and by a number of guests, who included Mr. F. W. Cross (Lea Bridge), Mr. C. H. Rutter (Brighton), Mr. John Terrace (South Suburban Gas Company), Mr. A. H. Andrews (Vauxhall), Mr. W. B. Leech (Beckton), Mr. A. Caddick (Croydon), and Mr. E. C. Holt (Gas Light and Coke Company). Among those regretting inability to attend were Mr. T. Hardie, Mr. F. M'Leod, and Mr. R. W. Foot.

The Loyal Toast having been honoured at the call of the President,

Mr. F. W. CROSS said his son occupied the post of honour as President, and he himself had to propose the toast of honour—"The Association." Theirs was a live Association, and it was a gratification to the seniors of the industry to see that it was so. They must show vitality, or they could not go ahead in the profession. If they wanted to occupy the higher positions of the industry, they must work very hard. They must keep at it, and not for one moment shirk their work. He would suggest that, as young men, they should put before themselves a goal, and then strive by all fair means in their power to reach it. He thanked the members for the honour they had done his son in electing him President.

Mr. W. GROGONO thanked Mr. Cross for his kind remarks, and added that it would be a great pity to make, as had been suggested in certain quarters, any change in the use of the word "junior" in connection with theirs and similar organizations. They were a Junior Association, and he did not see why any exception should be taken to the term. At the present moment their Association comprised 276 members; and he thought its strong position was maintained largely by the help received from the seniors and the directors of companies who permitted visits to their works.

Responding to the toast of "The Visitors" (which was proposed by Mr. F. J. PEARCE), Mr. A. CADDICK congratulated the Association upon being able to organize so enjoyable a social function. He had very pleasant recollections of their visit to Croydon, and hoped to see them there again soon. Mr. J. TERRACE also replied, and expressed his gratification at the success of the Association, which was doing excellent work. Not the least important work they had done was in connection with the initiation of the scheme for education in the gas industry. The question of the education of their staffs had been before the gas industry for quite a long time; but he hoped now they were going many steps farther.

Proposing "The President," Mr. FREDERICK A. FROST spoke of the great gratitude they felt to Mr. Cross for the strenuous work he had put in on behalf of the Association. The expectations they had when he took the Chair had been amply realized.

The PRESIDENT, in response, said the Chair of the Association should be one of the goals at which they should all aim. One thing he had desired to do was to secure affiliation between the Junior and the Senior Associations of the district; and they would be interested to learn that he had now received a letter from Mr. W. H. Bennett, the Hon. Secretary of the Southern Association of Gas Engineers and Managers, in which he said:

> I now have the pleasure to inform you that my Committee, desirous of assisting in every way possible the Juniors, agree to affiliation in principle, although they are not prepared to go quite so far as you suggest. They are, however, subject to agreement by your Committee and subsequent ratification by our members in general meeting (when the rules would have to to be altered), willing that the President and Hon. Secretary for the time being of the London and Southern District Junior Gas Association should be *ex-officio* members of the General Committee of this Association. On the other hand, our members shall nominate two of their members (of which one shall be the Hon. Secretary for the time being) as *ex-officio* members of the Council of your Association. In neither case are these *ex-officio* committee-men to have the power of voting.

This was an advance for which he thought they should be very grateful, and of which they should take full advantage. A second goal was to try to persuade the seniors to help the juniors by paying their Association subscriptions. Many companies paid the similar subscriptions of seniors, on the ground that their undertakings benefited from the meetings; and this argument would apply equally well to the Junior Associations. He thanked the Council and the members for the loyal support they had accorded him during his year of office, and especially did he thank the Hon. Secretary.

Other toasts were "The Secretary and the Treasurer," proposed by Mr. S. B. CHANDLER, and responded to by Mr. G. WINSLOW and Mr. A. BROADBENT; and "The Press," proposed by Mr. W. L. WESTBROOK.

The Better Sales Association at Cardiff.—Cardiff is making apid strides as a first-class shopping centre, and is determined to be in the front rank by the adoption of organized selling methods. The Better Sales Association of Cardiff has been formed for the purpose of giving men and women whose profession is "selling" a better knowledge of window and counter-display work, and salesmanship in its various branches. The President is the Lord Mayor of Cardiff (Alderman Dr. J. J. E. Biggs, J.P.), and the Association has an influential list of patrons and vice-presidents. A library has been formed to circulate useful literature among the members. The Association is non-Trades Union, and its motto is, "Do it Better." The first lecture and demonstration was given on Monday evening, Feb. 26, by Mr. H. A. Down, of Selfridges, London, on "The Art of Draping." Mr. Down convinced the audience that window dressing is a fine art, and an asset in the successful carrying-on of business. The membership of the Association has already reached a hundred.

YORKSHIRE JUNIOR GAS ASSOCIATION.

In last week's "JOURNAL" (p. 531), we published a paper read before the Yorkshire Junior Gas Association on Feb. 17 by Mr. E. L. Oughton (Huddersfield Gas Department) on "Subjects and Problems Associated with the Distribution and Utilization of Gas." This gave rise to the following discussion:

DISCUSSION.

The PRESIDENT, opening the discussion, said they had heard a paper of great interest to all, and particularly to junior members of the profession. The paper covered many points which could be applied and re-applied in everyday work. He thought the table of efficiencies, cubic feet per B.H.P. with gas of various calorific values, could be applied well to gas-furnaces. In regard to the latter, the lower the value of the gas, in his opinion, the smaller the advantage which could be taken of recuperation. The process of regeneration could be carried out to greater advantage the higher the calorific value.

Mr. S. T. S. MUSGROVE (Sheffield) remarked that when he listened to the many important points raised in the paper, and in particular to the wide variety of matters which were of importance to the younger members, he began to feel glad that some of them were getting rather older. There seemed a formidable list of subjects which a junior should tackle; but though they might at first sight make a young man "furiously to think," when looked into carefully they were found to be not so bad as might be imagined. The more they knew, not only of their own particular phase of work in the industry, but also of allied subjects, the better was their position to deal with points arising even in their own daily work; and he entirely endorsed Mr. Oughton's opening remarks. A good groundwork in scholastic education was essential. In most towns there were special facilities for extra study in most of the matters referred to in the paper; and they had to remember that even if the various formulæ looked rather formidable, there were such things as logarithms, slide rules, calculators, &c., designed to simplify calculations, whether in main-laying formulæ or other matters. The members of the gas industry were in constant competition with the electrical people, and could not know too much. Indeed, unless they were up-to-date with a certain degree of electrical information they could hardly regard their technical knowledge as complete. Referring to gas-furnaces, Mr. Musgrove said his experience was that these were the most sensitive appliances to deal with. A variation in calorific value, or in pressure or volume, was nothing like so noticeable a factor in lighting, cooking, or heating as in the case of a gas-furnace. A difference in calorific value of 20 B.Th.U. was instantly noticed in a furnace working at 800° to 1000° C. In this connection the advantages of the Gas Regulation Act could be fully appreciated, because they had to work to a standard calorific value.

Mr. C. T. B. ROPER (Bradford) entirely endorsed the observations made as to the importance of a thorough grounding in various aspects of the industry as the basis of the work of the successful gas engineer of the future. In furnace work gas had a serious competitor in the suction-gas plants, many firms putting in suction producer plants in an effort to cut-down costs; but where this was done it was found that a 6-in. pipe was laid, whereas for town gas a 2-in. or 3-in. pipe would have sufficed. Mr. Roper expressed the opinion that gas of low calorific value would not do the work in appliances designed for high calorific value.

Mr. C. R. INGHAM (Brighouse) complimented Mr. Oughton on the line taken in his paper, particularly in relation to the many subjects which should be studied by the junior who intended to progress. Knowledge on these subjects was essential before one could be considered thoroughly equipped: but after groundwork in the first principles, progress was not difficult. Mr. Ingham spoke of gas-meter experiences, especially of meters recently introduced. A 50,000 c.ft. per hour rotary meter was working satisfactorily as yet, though time only could tell as to its continued efficiency. In a reference to lighting, the speaker thought an inverted mantle made in two halves and joined, would obviate the knot at the bottom of the ordinary mantle, thereby doing away with the dark spot and hence increasing the light. With regard to electrical competition, he had lately been in contact with a medical man, who had been grumbling continually about his gas supply—probably a frivolous complaint, as there was nothing really wrong with the gas. Removing to a new house, the doctor declared he would have no gas, and spent £200 on a petrol engine, dynamo, accumulators, &c., and had to provide a special building in which to house this equipment. He then purchased an electric water heater and an electric kettle; but after using them for a very short time he declared his willingness to sell them very cheap. This was no testimonial to electrical appliances. Mr. Ingham, referring to varying processes of gas manufacture in different districts, emphasized the importance of the juniors studying these different processes. He deprecated the action of an appliance manufacturer in sending out an appliance not fitted for the work intended. The appliance he had in mind was sent out by a reputable firm, but was received by the users without gas or air adjusters, and they were trying to get a temperature of 340° C. from an appliance constructed to work at 240° C. Alterations had consequently to be made to the gas nipple and air inlet.

Mr. H. RHODES (Bradford) referred to Mr. Oughton's having 80 p.ct. of the fish friers' ranges in Huddersfield heated by gas. This was an industry which employed a good deal of heat; it was in itself a strong recommendation to the public who saw its use. In Bradford last year they had carried out fifteen such installations. They had done four during the past month, and they were all proving a healthy recommendation for the ranges and the Gas Department. With gas at 4s. per 1000 c.ft. and a varying scale of discounts, according to consumption, the running cost worked-out approximately at 8d. per £1 of the takings; but it could be reduced, and in one case which he had worked-out that day the cost was only 6d.

Mr. W. HEATHCOTE (Halifax), in reference to lighting, said he was in favour of the theoretical side of illuminating engineering being

applied in every case. From his own experience, over a wide area of gas lighting he favoured a large reflecting surface and good diffusion.

Mr. S. H. PACKER (Bradford) said Mr. Oughton's paper was exceptionally comprehensive. Those who realized that "knowledge is power" would recognize the advantages of Mr. Oughton's dictum. As a showroom man he was convinced that those employed on the sales side of the gas industry should understand the basic principles of light and heat. Frequently they would have to satisfy a client who required fittings to harmonize with some particular form of decoration; and in this connection it was sometimes unfortunate that the customer did not come for the lighting fittings before the decorating scheme was done instead of afterwards, as in many cases the showroom staff could suggest either a colour scheme or some harmony which would be more to the advantage of the consumer. Much had yet to be appreciated by the public in regard to the question of light-giving wallpapers, and the salesman should be well aware of the colour effects of these. Despite all the talk of electric lighting, he was getting more and more of an optimist as a seller of gas lighting equipment. Looking through his accounts with lighting firms for last year he found the totals of the previous year doubled, even though lighting equipment had been reduced in price. From all the things he heard he was not afraid of electrical competition in lighting. Recently in a lecture, reported in the public Press, a well-known scientist had declared that the people were being gradually driven blind by the use of electric light; and he thought this was a statement that ought to be used to the full in gas lighting advertising material. The study of the science of illuminating engineering should be applied to every case of gas lighting, and a great deal more business would result. In regard to the gas heating of fish-frying ranges, he advocated that departments should put the best men on this work, because the revenue from this consumption was high.

The PRESIDENT asked Mr. Packer, as a showroom manager, if he would care to express an opinion on dealings with plumbers with regard to gas appliances?

Mr. PACKER said various towns had different methods of dealing with the local plumbing trade. One undertaking would seem to be trying to break the plumber financially, while another—and a wiser—would set out to work harmoniously with him, and allow him a fair and legitimate profit. In Bradford he had had over nine years' association with the plumbers, and there existed a very cordial relationship between the plumbers individually, the local Master Plumbers' Association, and the Gas Department. His department had at the moment over 180 plumbers in their area with regular monthly accounts. They allowed the plumbing trade the same terms of discount as the makers allowed the trade. He found it advantageous to lay his cards on the table, and explain what both the plumber and the Gas Department were getting out of any transaction which the former might query. There were few such queries, because the department had successfully removed from the minds of the plumbers any suspicion which would ruin the hopes of successful working. The trade customers were themselves of great advertising value. When any special displays were planned, the plumbing traders would gladly avail themselves of appliances for their own shop windows if they knew they were being backed-up by a special window display at the central gas showrooms, and perhaps by some local advertising.

Mr. MUSGROVE, speaking on the subject of the fixing of governors, said he had no prejudice against governors, but he wanted to know where they were to be fixed. He had no objection to a governor on the immediate inlet to a furnace, but did not approve of it on the inlet or outlet of a meter. Where the supply to an appliance was constant, any throttling-down at the source would give unsatisfactory results.

Mr. OUGHTON did not favour a governor at the inlet or outlet of a meter, though he had no objection to one at the inlet of an appliance, providing a pressure chart had been on the particular point for at least 24 hours.

Mr. ROPER said he had that day been to a firm who complained about their supply; and the complaint was reasonable. They were using a suction-gas plant, alternating with town gas at will. They had a large gas-furnace in use, and expected good results from this arrangement. They had a pressure chart, and were now putting a governor on the inlet of the furnace.

Mr. INGHAM expressed the view that where there was considerable pressure fluctuation or fluctuation in local demand—as in a factory area—governors on the inlet of appliances were satisfactory.

Mr. RHODES spoke of the case of a biscuit factory, where a governor had been put on the outlet of the meter within four yards of a compressor used to boost up to 6 in. pressure.

On the proposition of Mr. J. W. CARLTON (Shipley), seconded by Mr. F. FIRTH (Leeds), a hearty vote of thanks was accorded Mr. Oughton.

Thanks to Mr. H. Singleton and the Halifax Gas Committee were carried, on the motion of Mr. F. A. C. PYKETT (Halifax, Hon. Secretary of the Association), seconded by Mr. E. GILLETT (Bradford).

The next meeting of the above Association will be in the form of a visit to the works of Messrs. Clayton, Son, and Co., Ltd., Hunslet, Leeds, on Saturday, March 17. After inspecting the shops and the work in progress, a visit will be paid to the Yorkshire Patent Steam Wagon Company's works and also the works of Messrs. Deighton's Patent Flue and Tube Company. Both these companies are allied to Messrs. Clayton, Son, and Co. The visitors will return to Leeds for tea.

Attention having been drawn to the "apparently large number of persons whose gas accounts during the quarter appeared excessive in comparison with the corresponding quarter," a resolution has been passed by the Turton Council "viewing with alarm the excessive gas bills being received as compared with previous corresponding quarters, and respectfully asking Bolton Corporation to furnish an explanation, and to look into the matter, with a view to the cause of complaint being removed."

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Cast-Iron or Steel Pipes in Gas Distribution.

SIR,—The letter of Mr. W. Methven in your issue of Feb. 28, advocating the use of cast-iron pipes, seems to take us back to prehistoric days—before the tomb of Tutankhamen was constructed. A generation has passed since steel gas mains were first laid, and the universal decay that was then predicted apparently still lingers in the imagination of a few. Cast-iron pipes have been known to perish by corrosion in not a few cases, and steel mains have all the advantage over them by reason of their bituminous wrapping. When, in another 3000 years' time, a future Lord Carnarvon and Mr. Howard Carter shall excavate in Western lands, it is the bitumenized steel pipes that they will unearth and carefully place in their museums as evidence of the gas practice of the period. The cast-iron pipes will have gone to graphite and completely disappeared.

But perhaps I am falling into the same error as Mr. Methven by attempting to predict. It is better to base one's argument upon events past and present. Neither the Bethnal Green tragedy nor the Leeds poisoning of Feb. 23 would have occurred if the gas mains had been of steel, instead of brittle cast iron; no one can gainsay this. Yet in all that has been written and reported in regard to such cases, I have not seen a single reference to the material of which the pipes were made, other than that contained in the address of Mr. E. L. Oughton at Huddersfield. There has been a good deal said about inspection; but we are not told exactly how inspection is going to prevent that which is breakable from breaking. I prefer the declaration of a past-President of the Institution of Gas Engineers, which appeared in your columns on Feb. 1, 1922. "Mains, services, fittings, and appliances should be constructed, maintained, and operated so as to make accident from leakage practically impossible." I cannot conceive that the Board of Trade would allow the use of brittle pipes for the conveyance of coal gas under our modern traffic, if they were to be introduced now for the first time.

Supposing that our railways had been started before the days of steel, and our trains had been run on cast-iron rails; there would be accidents arising from broken rails just as there are gas accidents arising from broken cast-iron pipes run over by motor buses. Then someone comes along and offers unbreakable steel rails, and they are rejected on the plea of short life and liability to corrosion—a definite "safety first" advantage sacrificed for a phantasy. Fortunately steel rails have got in first, and have not only saved us from many railway accidents, but have proved in their exposure to all weather conditions that the corrosion cry is unjustified.

We are living in a steel age, and when we come to the transmission under modern traffic of an inflammable and asphyxiating gas at high pressure, we pass it through steel pipes, securely jointed. Surely it is a mystery why steel pipes should be reckoned good for high pressure, but not for low. In fact it is particularly inconsistent from the corrosion point of view, because owing to the precipitation of moisture under pressure, both steel and cast-iron mains are liable to internal rusting in high-pressure systems, such as seldom occurs with low pressure. (The remedy for this is to bring about condensation at the works by a slightly higher compression and pass the gas into the mains dry.)

It is quite as easy to produce examples of corrosion in cast iron as in steel or wrought iron. There are varying qualities of cast iron, and varying qualities of steel, and many varieties of wrought iron. There are also good and bad soils in which mains and services are laid, and different degrees of carefulness or carelessness in the laying thereof. I do not remember ever having laid cast-iron pipes, having consistently refused to do so because they are breakable; but I have laid whole towns in steel.

London, March 3, 1923. B. R. PARKINSON.

SIR,—With reference to Mr. Methven's letter in your last issue, we have yet to hear of any such trouble as he suggests with our steel tubes, though these have been in use for gas mains for some twenty years. In several cases examinations have been made comparatively recently, and the mains have been found in splendid condition. Mr. Methven's experience with service-pipes really means nothing as applied to steel mains such as we make, as we use an entirely different kind of steel. No doubt your readers will recollect that Mr. Taplay, of the Gas Light and Coke Company, proved by experiments recorded in his paper given at the Gas Institution meeting in 1921, that our material outlasts both the low-tensile steel used for service-pipes and the steel used for holder sheeting, on which Mr. Methven bases his conclusions.

Moreover, there is not a shadow of doubt that such happenings as have occurred recently, in respect to the breakage of mains under strain, could not possibly have happened with our material, which has satisfactorily withstood far worse strains. It is rather a curious commentary on the subject that the same issue of your journal contains an account of two further cases of breakage of cast-iron mains in totally different circumstances.

As regards the question of durability, apart from such accidents (though we suggest the latter cannot be ignored nowadays), our opinion is that this is primarily a question of conditions; and while cases of cast-iron mains lasting fifty or sixty years may occasionally be quoted, we know of other cases in which they have not lasted fifteen or sixteen years. In some instances neighbouring steel mains have outlasted the cast iron.

THE BRITISH MANNESMANN TUBE CO.
67, *Queeen Victoria Street, E.C.* 4, FRED SYMES,
March 5, 1923. General Sales Manager.

A Study of Lighting Burners.

SIR,—I read with interest your Editorial headed "A Study of Lighting Burners," and agree with the greater part. There is one

statement, however, to which I take exception—viz., that "theoretical considerations did not greatly trouble me," and that I "preferred to proceed empirically." I would not have objected if you had stated that I had proceeded on practical lines, because these are the lines on which all other burner manufacturers proceed.

From a careful study of burners produced by acknowledged leaders of the incandescent burner industry, it is evident that some of the makers have no theories at all worthy of the name, and it is more by chance than by good theory or good practice that some of the burners are reasonably efficient. Relative to this I would refer you to the latter part of the third paragraph in Prof. Cobb's statement with reference to the research on aeration in atmospheric burners, and also to Dr. Carpenter's statement regarding the entrainment of air by gas issuing from the bunsen jet.

Considerable experimental work was done prior to the designing of the series of burners mentioned in my paper; and with a few small exceptions, all account of this work was omitted. You may also have noticed that the results of comparisons with other makers' burners were not mentioned, though numerous tests were made. I need not remind you of the old dictum relating to comparisons—I am aware that it can cut two ways.

The sole object of the paper was to stimulate the interest of my brother engineers in the lighting side of our business, and to avoid side issues which might tend to withdraw attention from the main object.

Gas-Works, Todmorden, March 3, 1923. F. V. BARNES.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Progress of Bills.

Macclesfield Corporation Bill, and the South Elmsall and District Gas Bill: Read a second time, and committed.

A Bill to confer further powers on the Smethwick Corporation with respect to their gas undertaking was read, and referred to the Examiners.

HOUSE OF COMMONS.

Progress of Bills.

Hoylake and West Kirby Gas Bill: Standing Orders not previously inquired into have been complied with, and the Bill committed.

Gas Supplies (Carbon Monoxide).

Mr. AMMON asked the Parliamentary Secretary to the Overseas Trade Department, as representing the Ministry of Health, whether he had received from the Camberwell Borough Council and other borough councils a request to appoint a Committee to investigate the composition of gas supplied by various gas undertakers, and to report as to whether it was practicable substantially to reduce the amount of carbon monoxide therein, and that the Committee be asked to report as to the tests which should be made by gas undertakers from time to time to ascertain the condition of gas mains, services, consumers' fittings, and other gas apparatus; and whether he proposed to take any steps to meet the request.

Sir P. LLOYD-GREAME said that he had been asked to reply. The answer to the first part of the question was in the affirmative. He would, however, refer to the reply given to questions by Mr. Harris and others on Feb. 19, and to the statement which was made on the 21st ult.

Patent Fuel Industry.

Mr. MARDY JONES asked the Secretary for Mines whether his attention had been called to the serious plight of the patent fuel industry in South Wales, due to the high price of pitch, which is the vital binding ingredient in the manufacture of patent fuel from small coal; whether he was aware that the Secretary of the Coal Owners' Association of South Wales alleged that the high price of pitch was solely due to the abnormal use of pitch for road making resorted to by local authorities, who could utilize satisfactory substitutes for pitch for road making; and would he inquire into the matter.

Lieut.-Colonel LANE-FOX stated he was aware of the facts, though he believed that it was incorrect to attribute the high price of pitch wholly, or even mainly, to the use of tar and pitch for road making. In so far as this was an element in the case, he understood the representations recently made by the patent fuel manufacturers were receiving consideration, and that the patent fuel manufacturers were taking the matter up with county councils.

Reduction in Price at Wolverhampton.—The Wolverhampton Gas Company are reducing the price of gas as from the readings of the meters for the March quarter. The prices will then be: For lighting and domestic purposes, 10·2d. per therm, or 3s. 9·9d. per 1000 c.ft.; for manufacturing and power purposes, 8·4d. per therm, or 3s. 1·8d. per 1000 c.ft.; and for slot meters, 8·4d. per therm, or 3s. 1·8d. per 1000 c.ft.

Halesowen Gas Company.—The annual meeting of the Company was held on Wednesday last, when the balance-sheet and accounts for the year ended Dec. 31, 1922, were presented. The profit for the year (after payment of debenture interest £125, and writing-off depreciation of motor vehicles, £206) amounted to £1682, which sum added to £650 brought forward from last year totalled £2332. The dividend paid in February, 1922, absorbed £553, while the interim dividend paid in August, 1922, amounted to £573, making a total of £1126, leaving a balance available of £1206. The Directors recommended the payment of a final dividend of £12 p.ct. on the "A" shares (making 11 p.ct. for the year), and £8 8s. p.ct. on the "B" shares (making £7 14s. p.ct. for the year), less tax, taking-up an amount of £711. A sum of £300 was recommended to be transferred to renewals account, leaving a balance of £194 to be carried forward.

MISCELLANEOUS NEWS.

GAS REGULATION ACT APPLICATIONS.

The following further notices have appeared in the "London Gazette" with regard to applications to the Board of Trade for an Order under the Gas Regulation Act.

DECLARATIONS OF CALORIFIC POWER.

Kirkburton Gas Light Company, Ltd.—500 B.Th.U. (March 19.)

SPECIAL ORDER.

Brierley Hill District Gas Light Company.

The Company have applied for a Special Order under section 10 to extend and define the limits of supply, to confirm the purchase of land from the New Kinver Gas Company, Ltd., to use for works purposes land scheduled, to increase their borrowing powers, to establish profit-sharing, and to make further provisions regulating the supply of gas.

REPORT OF OFFICIAL TESTINGS OF LONDON GAS.

For the Quarter ended Dec. 31.

The report of the official testings of the gas supplied by the South Metropolitan Gas Company for the quarter ended Dec. 31 last has been received from the Gas Referees—Prof. C. V. Boys, Mr. W. J. A. Butterfield, and Dr. J. S. Haldane. They certify that the Company fulfilled their statutory obligations in respect of the calorific value and pressure of the gas supplied, and except on two occasions, when the default was proved to be not substantial and not due to the careless conduct of the Company or their servants, had fulfilled them in respect of purity.

[The Company were required to supply gas of an average calorific value for the quarter of not less than 560 B.Th.U. gross per cubic foot—at which value 1000 c.ft. are equivalent to 5·6 therms.]

The average calorific value for the quarter was 565·2 B.Th.U. gross.

On no day in the quarter for any period was the calorific value at any testing-place deficient by 6 p.ct. or more.

No trace of sulphuretted hydrogen was found at any testing-place on any day during the quarter, except on one day at the testing-place at Peckham, and on one other day at the testing-place at Lewisham Road. The Chief Gas Examiner has decided in regard to these two cases that "the default of the undertakers was not substantial, and was not due to the careless conduct of the undertakers or their servants; and I determine that no forfeiture be incurred by the undertakers in respect of such default."

On no day in the quarter was the pressure at any testing-place less than 2 in.

EXPLOSION AT A BIRMINGHAM GAS-WORKS.

Shortly after eleven o'clock on Sunday morning a serious explosion occurred on a Mond-gas plant at the Birmingham Gas-Works at Saltley. Sixteen men were injured, three seriously. It is not known precisely what was the cause of the explosion; but according to Mr. A. W. Smith, the Secretary and Manager, the experts take the view that it was due to the spontaneous combustion of finely-divided particles of carbon in the Mond-gas main. The work of cleaning-out this main was begun on Saturday, and the job was being completed on Sunday when the explosion took place. About 60 men were engaged at the works at the time, and some had miraculous escapes. Extensive damage was caused to the power house and to the large gasholder. The explosion was heard a mile away; and a huge cooling tower of wood immediately burned fiercely. The glass roof of the power house, a hundred yards away, was shattered, and windows of private houses a quarter of a mile away were broken. Sheridan, one of the injured workmen, was hurled into a tar vat, ten yards from where he was working, and was brought out unconscious. The rescue brigade attached to the works promptly rendered efficient work; and three men were hurt in their gallant efforts to reach the other men. The flames were got under control by the fire brigade within a couple of hours.

Mr C. Carrington Barber, the Resident Engineer, when interviewed, said the first thing he saw was a sheet of flame issuing from the Mond-gas plant. It leapt hundreds of feet into the sky. The cooling tower caught fire at once. He immediately concentrated, he said, on the prevention of further explosions, and shut-off the gasholders in order to stop the flow of gas. Mr. Barber added that the force of the explosion sent an iron flange from one of the mains—weighing several hundredweights and measuring about 80 sq. ft.—whirling through the air. It crashed through the roof of the paint shop, more than fifty yards away. Fortunately no one happened to be in that part of the works at the time. As the explosion was in an upward direction, the results were much less disastrous than would have been the case had it been lateral. He added that no gas was being produced at the time of the occurrence; otherwise there would have been 300 or 400 people at work.

The scene of the explosion was visited on Sunday by Alderman J. H. Lloyd (Chairman of the Gas Committee), Mr. A. W. Smith (Secretary and Manager), Mr. J. Foster (Engineer-in-Chief at the Birmingham Gas-Works), Mr. Darrah (Resident Engineer at Nechells Gas-Works); and Mr. T. H. Hack (Engineer at Saltley).

By a fire in the early hours of the morning last Saturday week, at the factory of the Peerless Incandescent Mantle Company, on the banks of the River Wandle at Wandsworth, a long range of buildings was destroyed.

BRIGHTON AND HOVE GENERAL GAS COMPANY.

A Gratifying Position.

The Annual Meeting of the Company was held last Friday afternoon, at the Offices, No. 5, Great Winchester Street—Mr. A. M. PADDON (the Chairman) presiding.

The SECRETARY (Mr. E. L. Burton) read the notice convening the meeting; and the report of the Directors and the statement of accounts for the year ended DEC. 31 were taken as read.

The CHAIRMAN, in moving the adoption of the report and accounts, said the report referred to the increase in business during the past year. The sales of gas, as compared with those of the previous year, showed an increase of over 48 million c.ft., or 2·69 p.ct. This was a satisfactory increase; but a good deal had been done by the Company to encourage this extension of demand. Altogether in the last eighteen months they had come down from a maximum charge of 1s. 2d. per therm to the present rate of 10½d. per therm. This latter figure obtained from the beginning of the present year, and so was not really germane to the report before them; but it showed the direction in which they were moving. All their endeavours would be addressed to continuing this process of reduction; for the Directors were firmly convinced that the question of price was at this particular juncture one of vital interest to the gas industry. Passing to the accounts, he might mention that, while the total capital receipts amounted to £883,196, they had still less than £500 per million c.ft. of gas employed in their business; and they would agree that, having regard to what lay immediately behind them, this was a very good figure. On capital account they had spent during the year £36,753 in connection with new buildings, property, and plant; but of this they had, through depreciation, written-off £7171. The balance of capital account was £70,435; but, of course, this was qualified by the special method of accountancy employed in their Company of putting an item as a liquid one in the balance-sheet of £69,112 for prepayment meter fittings, stoves on hire, &c. The figures in the revenue account were fairly satisfactory. They had obtained £29,000 less for gas, meters, stoves, and fittings; and the residuals had fallen away by £28,000. These latter, however, still represented 42 p.ct. of the amount expended on raw material, which was not altogether unsatisfactory, though they thought it was a ratio upon which they could improve. Coal, oil, and coke had cost over £82,000 less. Repairs and maintenance had increased by £11,000. In their special circumstances of extension and re-construction, of course, the objects on which this money was expended did not strictly apply to the description. There was a good deal of disused plant that had to be written out. Repairs and maintenance of meters showed a small decrease, but stood at the very fair figure of 2·1d. per 1000 c.ft. It was an essential matter that the meters of a Company should be kept in absolutely proper order. The maintenance charges in the aggregate were ample for all purposes. For the benefit fund account they had taken £3828 from the profits; and having regard to their comparatively newly established co-partnership system, this was a fund which they could with advantage supplement and strengthen. The fund was a great source of comfort and confidence to all employees of the Company, and supplied a powerful backbone to their relations with their officers and men. Co-partnership absorbed £6696; and judging by accomplishments, he was inclined to say that this was nearly the best spent money of the account. He was more than ever convinced that they had done a wise thing in the institution of co-partnership. There had been carried to the special purposes fund account £6381. All these latter facts required to be clearly visualized before one could properly understand the merits of the statement of accounts. Taken as a whole, they were exceptionally good. They were enabled to meet the abnormal items he had mentioned, and to carry forward £80,311, which, supplemented by the amount from the previous account, gave a total disposable sum of £101,561. After meeting various charges, they had an amount to deal with of £59,142; and after payment of the dividends recommended, an undivided balance of £33,216 would go forward, against £21,249 brought in. Taking all these figures as a whole there was a good deal upon which to congratulate themselves. Of course, the proprietors would be anxious with regard to what might be expected from the current period. In this respect, their lot was the common one of the gas industry generally. The attacks that had been made upon the industry were as well known to the proprietors as to the Board. They might be reassured if he told them that the gas as distributed by their Company to-day did not vary in any way from that which was sent out a quarter-of-a-century ago.

The DEPUTY-CHAIRMAN (Mr. G. W. Carey) seconded the resolution, which was unanimously carried.

On the proposition of the CHAIRMAN, seconded by Mr. A. F. PHILLIPS, dividends were declared at the rates of 11½ p.ct. per annum on the original ordinary stock and of 8½ p.ct. per annum on the "A" ordinary stock, both less income-tax.

The retiring Directors (Mr. F. H. Jones and Mr. J. M. Miles) were re-elected, on the motion of the CHAIRMAN, seconded by Sir C. L. MORGAN, C.B.E. Mr. Lewis Hardy was re-appointed an Auditor, and Mr. William Cash Special Auditor, under the provisions of the Brighton Company's Act.

The CHAIRMAN proposed a hearty vote of thanks to the officers and staff for their services during the period under review. He said that an immense amount of work had been accomplished in the way of strengthening the Company's position and equipping it to deal with demands that might be expected in the future. If these measures had been effective, it was preponderatingly due to the energy and initiative of the executive officers. They had succeeded in presenting that day a splendid account from every point of view, and for this the thanks of all were due to Mr. Burton and Mr. C. H. Rutter (the Engineer and General Manager), and their respective staffs.

Mr. SAMUEL SPENCER seconded the vote, which was heartily accorded.

Mr. BURTON, in returning thanks, mentioned that he was within a month of completing forty years' work in those offices.

Mr. RUTTER said the vote would be greatly appreciated by the co-partners, who constituted the entire regular staff at the works. He put down the success of the past year to a very great extent to the operation of the co-partnership scheme.

The meeting closed with a vote of thanks to the Chairman and Directors, which was proposed by Mr. HOUNSOM, and seconded by Mr. OKE.

LEA BRIDGE DISTRICT GAS COMPANY.

The Annual General Meeting of the Company was held at the offices, Nos. 63 and 64, Chancery Lane, W.C., on Tuesday of last week—Mr. A. M. PADDON presiding.

The SECRETARY (Mr. Richard Sandell) read the notice convening the meeting; and the report and accounts were taken as read.

The CHAIRMAN, in moving the adopton of the report and accounts, said that, dealing first with the report, they would see it recorded that the Company had had recourse to the Board of Trade for a Special Order under the provisions of the Gas Regulation Act, and had obtained it. The facilities now afforded by the Board of Trade were somewhat attractive; and speaking with some experience of Governmental procedure, he thought those who desired any further powers in this way had better acquire them as soon as they could, because practice did not increase the generosity with which Parliament conceded these matters. Those who came first were apt to be very much better served than those who arrived later. The Company were obliged to go for this Order, because they needed additional storage for gas, and had required it for the last twenty years. They had to secure powers for acquiring fresh land to this end; and he was glad to say they had got both the powers and the land. Those who were conversant with gas administration knew that this was an awkward stage to pass through. People knew exactly what one wanted the land for; and price and conditions were accommodated to one's requirements. But the Company had not made a mistake, he thought, in policy or in price, on this occasion. Other powers had also been obtained—such as the holding of annual meetings, and for regulating matters in the ordinary course of administration in connection with which the Directors had formerly to apply to the proprietors.

AN INCREASE IN BUSINESS.

Then the report went on to state that there had been an increase in the sale of gas during 1922 of 1½ p.ct. over 1921. This was a characteristic of their undertaking and satisfactory under the circumstances. The most gratifying feature in connection with it was that he could assure them this growth was still being maintained, whereas many companies who last year had a hectic expansion of their business were now feeling the reaction. It was far more advantageous, both to the proprietors and to the administration, that increases in business should be moderate and continent in character, and regularly maintained, rather than that there should be excessive additions at sporadic periods. The latter did not tend towards economy or assist the management. The report also recorded the deaths of Mr. Thomas Maskall and Mr. James Randall, the Company's Auditors; but inasmuch as there had quite recently been an extraordinary meeting to deal with this very matter, he would not now make any further reference to the loss which the Company had sustained, except to say it made a great break in the traditions of the Company, for both gentlemen were links with the older order of things which some of those present were able to remember.

THE ACCOUNTS.

Looking shortly at the accounts themselves, it would be seen that their capital powers had been augmented by their recent application; and there now remained unissued £208,000. The loan capital had also been increased in a different ratio in regard to the ordinary capital; and there now remained to be borrowed over £109,000. It should be noticed that they had disbursed a good deal on capital account during the year—£22,697; but this intimation was followed by the record of a most satisfactory process, by which they had written-off through revenue nearly £12,000. Consequently, to that extent, this capital outlay would not make any demand upon them for dividend or interest. The capital receipts stood at £390,460; and if they made some allowance for the amount of capital added on conversion many years ago, this represented under £500 per million c.ft. sold—quite a satisfactory figure, so far as their Company were concerned. He and Mr. Sandell could remember the time when it was somewhere about £1200 per million c.ft. On the credit side of the revenue account they would be prepared for some falling-off, if only by reason of the very important reductions that had been made in the price of gas, which had been brought down during the period to which these figures related from 1s. 1d. to 11d. per therm. This process the Board did not despair of continuing; for they recognized that it was more necessary now than perhaps at any time in the history of the industry that they should accommodate the price of gas to the economic requirements of the consumers. They had suffered a decrease for private and public lighting of over £21,000; and the total decreases on this side of the account amounted to nearly £28,000. When, however, they came to the other side, it was seen that they had, while maintaining a high standard of efficiency, been able to show reductions in the expenditure more than commensurate with what had been lost in rental. The total reductions on the debit side of the account amounted to £37,391; and deducting from this the decreased sum received left a balance of £9415, which was added to their profit, making the profit £33,308. He had already said that, before approaching this question of profit, liberal apportionment had been made for the maintenance of the assets and the efficiency of the works; and apart from this there had been certain definite economies which had very much helped towards the desirable result he had alluded to. The carbonizing wages had come down to 3·41d. per 1000 c.ft., and he had no doubt they would come lower still. They had been reconstructing and enlarging their carbonizing plant all through this period; and it was only fair to Mr. Cross to say that the figure he had mentioned was a very good one indeed. Further on in the accounts it would be seen that they had mulcted their profits of

very considerable specific amounts. They had carried £1500 to the benefit fund. Embarking on the principle of co-partnership with every good augury and every sympton of success, this was a fund they should support in every way. Much of the enlarged profits they showed that day were due to the establishment of a better feeling between themselves and their men. The human element was after all the most important of all; and he thought people had begun to realize this more now. Therefore this addition to the benefit fund was based on sound business, as well as sound policy. Then they had placed £2700 to the special purposes fund. This was a fund which was very important when they were enlarging or reconstructing their works. Co-partnership figured at £2294. It showed the strength of the revenue account when they could meet all these items, and yet carry forward the substantial balance they did. Turning to the profit and loss account, the amount brought into account was £7664. There was a small sum for interest; and the addition of the profit he had alluded to made a total of £41,286. After meeting interest on debentures, income-tax, and interim dividends, there was a balance of £22,887 remaining; and when the dividends now recommended had been paid, there would be carried forward to next account £16,872, instead of the £7664 brought in. The reserve fund had been strengthened by the amount previously sanctioned by the proprietors; and they had shown in the account the profit obtained by the transfer of stock from one security to another. The balance-sheet showed that they had on deposit on Dec. 31 nearly £30,000. This could be taken in connection with the fact that the balance at credit of capital account was only £1809. The retorts renewal fund stood at £10,173, which would be a great protection to the revenue account in the future. It was an added security, provided owing to the fact that they had much new carbonizing plant, the repair of which must be a matter more for the future than for the present.

THE IMPORTANCE OF THE PREPAYMENT CONSUMER.

Now as to the prospects. There were many peculiarities in connection with the business of their Company. One was the great extent to which they depended upon prepayment consumers. Of the total number of some 26,000, no less than 17,000 were prepayment consumers. This did not mean that 17-26ths of the gas was sold to them; but he did venture to think that, whereas twenty years ago this class of business provided some conjecture as to its advantage, to-day it was the greatest safeguard that the gas industry had got. The prepayment consumer had acquired experience, and had reduced to practice a perfectly definite conception of the economy of gas. In the case of a larger house, the user had not this clear conception of the benefits immediately derived from the consumption of gas. The knowledge of the prepayment consumer was, to his (the Chairman's) mind, the basis and source from which people would acquire a general idea of what the value of gas was. A few days ago a poor woman said to him: "I have a prepayment supply. For 1s. a week, I can do all my washing, all my cooking, all my ironing, and my domestic work; but my landlord makes me use electric light. I have three electric lights, and they cost me 1s. 6d. a week, though I never use them when I can avoid it." If the big householder really understood all this, he did not know to what figure their gas rental would go up to.

CARBON MONOXIDE AND THE THERM.

He was not going to say much about carbon monoxide and the therm. The agitation against the therm had brought upon it the fierce light of public inquiry; and when the report of the Committee came along, he wished those who instigated the inquiry joy of it. As to the dangers of gas, they were just the same to-day as a hundred years ago. Though it was represented that the gas supply differed greatly from what it was years ago, he could assure them that this was absolutely untrue. There was no difference in the gas supplied by their Company from that sent out twenty-five years ago; and when it came to any practical effect upon the consumer, such difference as supervened then could not possibly have had any. So they could leave these two matters altogether. What they had with confidence to look forward to was the public grasping, through the medium of the small consumer, what gas really meant to them. And apart from everything else was the vital question of public health. Many of those present would remember the state of things that used to prevail in London with the fogs; and the change that had come about was wholly due to the gas industry. In face of this, he was absolutely amazed at the attitude of the section of the Press which seemed to make a dead set at gas, and to do all it could to discredit the industry.

The DEPUTY-CHAIRMAN (Mr. G. W. Carey) seconded the resolution, which was unanimously carried without discussion.

THE DIVIDEND AND RE-ELECTIONS.

Proposed by the CHAIRMAN, and seconded by Mr. A. F. PHILLIPS, dividends were declared at the rates of 5 p.ct. per annum on the preference stock and 6½ p.ct. per annum on the consolidated ordinary stock, both less income-tax.

The DEPUTY-CHAIRMAN proposed that Mr. Paddon be re-elected a Director of the Company. He remarked that Mr. Paddon's great qualifications as a gas director were so well known to the proprietors and to the industry generally that it would be impertinent on his part to enumerate them. They were very fortunate indeed to have him as their Chairman. His judgment and great gifts were reflected in the excellent accounts before them.

Mr. J. M. MILES seconded the motion, which was agreed to, as also was the re-appointment as an Auditor of Mr. R. E. Gisburne, on the proposition of Mr. BECK, seconded by Mr. H. F. PARDY. It was pointed out that Mr. Gisburne had been a partner with the late Mr. Maskall, and for many years assisted him in the auditing of the accounts.

VOTES OF THANKS.

The CHAIRMAN proposed a hearty vote of thanks to the officers and staff, who, he said, deserved every possible recognition and encouragement at their hands. The Company had never been an easy one to engineer or manage. Mr. Cross preserved an excellent relationship with the authorities around, for which they were deeply indebted to him. As for Mr. Sandell he had been connected with the Company since it was founded in 1868, and was exceedingly valuable to them.

Mr. F. R. SMITH seconded the vote, which was cordially passed, and acknowledged by Mr. SANDELL and Mr. F. W. CROSS (the Engineer and General Manager). Mr. Cross said his work was rendered easier by the devotion of the staff under him, who all worked well.

A vote of thanks to the Chairman and Directors brought the proceedings to a close.

PORTSEA ISLAND GAS LIGHT COMPANY.

The Half-Yearly Meeting of the proprietors of this Company was held on Feb. 22—Mr. T. H. F. LAPTHORN, J.P., the Chairman, presiding.

Moving the adoption of the report and accounts, the CHAIRMAN said these were the best they had been able to put before them for a considerable time, for they showed progress in every direction; the sale of gas had increased and their profits had been larger. Dealing with the revenue account, and taking the receipts first, he said the receipts from the sale of gas were down by £3,428, due entirely to the reductions they had been able to make; while the rents for meters and appliances had increased by £2066, accounted for by a larger number in use compared with the corresponding six months of 1921. All the figures which he was about to give were in comparison with the second half of 1921. Their coke receipts had decreased £1998. They had produced more coke; but the average selling price had been reduced by 15s. 10d. per ton. Breeze gave them £916 less. They had not produced so much; and the price had been lowered to the extent of 3s. 9½d. per ton. Tar had fallen by £3660. They had made a great deal more tar; but the price had dropped by nearly threepence per gallon. Ammoniacal liquor and sulphate of ammonia had produced £3046 more; and this was the only item in the receipts for residuals which showed an improvement. They had produced more liquor, and the market price had much improved. But if there had been a falling-off in the receipts, there had also been a considerable falling-off in the expenditure. Coal and oil had cost them £44,563 less. They had used 4022 tons more coal and about 174,000 gallons less of oil. The coal had cost on an average 15s. 9½d. per ton less. At the present moment there was a tendency to harden in the coal market, due partly to trouble in the Ruhr district, and to a threatened coal strike in the United States which had caused a demand to be made from the States for English coal. During the last few days the Directors had placed a contract for a quantity of coal at an increase of 1s. 4½d. per ton. The net cost of their coal, after deducting residuals, was less by 2½d. per therm, or 11½d. per 1000 c.ft. They had spent £846 more in purifying the gas. They had previously six boxes containing the purifying element, but had now increased the number to eight. Wages had dropped by £5257, and repairs to works and plant were down £3518, due to a fall in wages and in cost of material. There was also a saving of £7823 under the head of "extraordinary renewals." This item, which was in the second half of 1921 as the balance of an expenditure in previous years, had been carried over a number of years; but by the end of 1921 they had wiped this out completely, and therefore it did not occur in the present accounts. The repairs to hired appliances had been £2136 more, due to the fact that a large number of cookers had been repaired. Rates had fallen by £607, and general charges were down by £1488. Contributions to the officials' superannuation fund were up by £564, about £200 of which arose from the fact that they were now paying their contribution on war bonus as well as on wages, and the remainder because they had found, in the past, they had not been paying quite the amount they had pledged themselves to pay as a company. The result of the half-year's trading was that they had made a gross profit of £38,868. Deducting from this certain items of interest which they had to pay, income-tax, and the usual contribution to the insurance fund, £2258, and then adding to the balance a sum of £20,549 with which they started the half year, they had available the sum of £47,678. They recommended the same dividend which they paid last half year, which would require a sum of £18,682, leaving them a balance of £28,995 to carry forward to the next half year. The sale of gas was 4,272,925 therms, representing an increase of about 4½ p.ct. Cookers had increased in number by 3377, or very nearly 10 p.ct.; fires had increased from 3133 to 6199, so they had nearly doubled in the twelve months, largely the result of an intensive canvass undertaken at Mr. Stibbs' suggestion, which had been extraordinarily successful. Last year they took from the automatic meters no less a sum than £220,128, or 52,830,720 pennies—nearly 500 tons of copper coins. They had been able during the past fifteen months to reduce the price of gas five times. Starting at 1s. 2d. per therm, they had brought it down to 9d. The official reports as to the quality of the gas were excellent; the tests made during the quarter had shown them to be always over the required standard. The pressure had never been as low as the prescribed minimum of two inches; the average was about four inches, and it had been five inches. The Chairman closed his remarks with an expression of the Directors' appreciation of the ability shown by both Mr. Stibbs and Mr. Carmichael, heads of their respective departments, and to the whole of the staff and employees for the zeal they had shown in the performance of their duties.

Mr. A. W. OKE seconded, and the motion was carried.

Weary Directors.—In a letter to the Bilston Urban District Council, the Engineer of the Gas Company (Mr. W. H. Adams) says: I am to inform you that my Directors are rather weary of the very indefinite charges usually made at your Council meetings by individual members of your Council whenever the name of my Company is mentioned at your meetings. I am also instructed to inform you that gas is now sold by Act of Parliament on its calorific value, and that the records of my Company conclusively prove that the calorific value of the gas supplied has in no single instance fallen below the declared value of 450 B.Th.U. If you have any definite complaints to bring to my notice, I shall be pleased to make every inquiry into the matter; otherwise I can only come to the natural conclusion there is no basis for these occasional complaints at your Council meetings.

BARNET DISTRICT GAS AND WATER COMPANY.

Satisfactory Working Results.

The Half-Yearly Meeting of the Company was held on Monday of last week at the London Offices, No. 139, Cannon Street—Mr. ARTHUR F. PHILLIPS in the chair.

The SECRETARY (Mr. E. D. Davey, A.C.A.) read the notice convening the meeting; and the Directors' report and the accounts for the six months ended Dec. 31 were taken as read.

The CHAIRMAN, in moving the adoption of the report and accounts, said the Directors had not had to contend with difficulties in obtaining a supply of coal or with labour troubles, which had been a relief compared with several previous half years. The results in both the gas and water undertakings might be considered satisfactory; and it would not be necessary to further deplete the Company's accumulated funds, as had been the case in some former periods. The gas-rental for the half year was £31,956, against £31,725 in the corresponding previous six months; the consumption of gas showed a decrease of only 1¼ p.ct., probably due to the mild winter. The cost of coal was £16,322, against £20,485. Wages were also reduced from £2701 to £2201. The repairs of works were slightly higher at £6288, as compared with £6026. All other charges remained much the same. The balance of revenue was £8782, against £6683, an increase of £2099, which justified the Directors in giving notice that the price of gas would be reduced. The price of gas throughout the half year was 1s. 1d. per therm, against 4s. 6d. and 5s. 3d. per 1000 c.ft. for the corresponding half of the previous year. The charge for gas was now uniform throughout the Company's district. Those areas where gas was charged at a higher price had reaped the benefit of the reduced figure. In the water undertaking, the rental was £32,799, against £27,900 in the corresponding period. The pumping charges were £6118, against £7355. Repairs of works were £3983 as compared with £2950. All other charges remained much the same, and the balance of revenue was £13,477, against £8326. Adding the balance of revenue from the gas undertaking, £8782, and the balance of revenue from the water undertaking, £13,477, to the balance in profit and loss of £18,773, transferring £5000 to the contingency fund, and providing for income-tax and interest on loans, left an available balance of £31,170, of which the proposed dividends would absorb £12,412—leaving an amount to carry forward to next half year of £18,758. This was about the same as the sum brought in. The gas-works had been maintained in a thoroughly efficient state, equal to meeting all demands likely to come upon them. As he had stated on previous occasions, the water supply of this important district demanded much consideration, and the working of five pumping-stations. At the meeting in August last, he informed the proprietors that the Company were constructing another pumping-station at Roestock. The borings had been completed, and the test of the yield of water was most satisfactory. As mentioned in the report, the Directors intended reducing the price of the gas from the next reading of the meters by 1d. per therm. The Company looked forward to further reductions; but unfortunately the coal contracts which had so far been made showed that there would be an increase in the cost of coal for the next year. The Press had contained many articles complaining of the therm system of charging for gas, and other matters. It was, however, not necessary for him to enter into them, as they had been so fully discussed. In the Barnet district there were few complaints; and he would take this opportunity of stating how well the staff, officers, and men had worked during the past half year, which has resulted in the successful operation of the undertaking. Unfortunately the Barnet Company must continue to hold half-yearly meetings, because no change could be made under the powers of a Water Order which would enable them to discontinue this practice.

The DEPUTY-CHAIRMAN (Dr. J. W. L. Glaisher, F.R.S.) seconded the motion.

Mr. H. F. PARDY having asked one or two questions as to the working, remarked that the Board had done uncommonly well. They had put before the proprietors a statement of accounts which must be considered satisfactory.

The resolution was then put to the meeting and carried unanimously.

On the proposition of the CHAIRMAN, seconded by Mr. COLIN DOCWRA, dividends for the half year were declared at the rate of 10 p.ct. per annum on the "A," "B," and "C" stocks and 7 p.ct. per annum on the "D" capital gas and water stocks, all less income-tax.

The retiring Directors (Messrs. Samuel Cutler, Jun., and Colin Docwra) were re-elected, on the motion of the CHAIRMAN, who assured the proprietors that these two gentlemen were most valuable members of the Board. They all knew what great experience Mr. Docwra had had as a water engineer; and Mr. Cutler possessed likewise great knowledge of the gas industry. The retiring Auditor (Mr. C. P. Crookenden) was also re-appointed.

Mr. J. M. WOOD remarked that it was some years since the Directors had had any addition made to their remuneration, though the work entailed in the administration of the undertaking had largely increased during recent years. He therefore begged to move that the fees of the Directors be increased £150 per half year for each of the two undertakings, on similar conditions to the present fees.

Mr. ELLIOTT seconded this, and it was unanimously agreed to.

The CHAIRMAN proposed a hearty vote of thanks to the chief officers—Mr. F. J. Bancroft (the Engineer and Manager) and Mr. Davey (the Secretary)—and the staffs under them. He considered the results both of the gas undertaking and of the water department to have been exceedingly good. Expenditure had been kept down as low as possible; and if the figures were analyzed, it would be seen that the working had been very efficient.

Mr. ELLIOTT seconded the proposition, and suggested that the Chairman and Directors should be included in the vote, which was heartily accorded by those present.

The CHAIRMAN, returning thanks for himself and his colleagues, said the Board were grateful to the proprietors for the support they received, and for the acknowledgment made of their services by an increase of their remuneration. The water supply of their large district required much thought and care. It was a difficult area to supply, because they could not obtain a great quantity of water in any one spot.

Mr. BANCROFT also acknowledged the vote, and declared that the Company possessed an excellent, loyal, and hard-working staff.

DERBY GAS LIGHT AND COKE COMPANY.

Mr. WOOLLEY presided over the annual general meeting of the Company, which was held on Feb. 23.

The CHAIRMAN, in moving the adoption of the report, said that the price of gas had been reduced from 10d. to 9d. per therm, making the charge to ordinary consumers 3s. 7½d. per 1000 c.ft., and that used for manufacture and power purposes had been reduced by 2d. per therm, being nearly 10d. per 1000 c.ft., bringing the price down to 2s. 9⅝d. per 1000 c.ft. The policy of the Company was to sell gas at the lowest possible price compatible with proper maintenance of the works and plant, and reasonable return to investors for use of their capital. Those who had studied the balance-sheet would see they had had a successful year, and although the downward trend of coal prices prevailing last year appeared to have been stayed, and prices were now in an upward direction, it was his pleasing duty to announce that the Directors had decided to make a further reduction of one penny per therm, or 5d. per 1000 c.ft., less discounts. For industrial purposes the price would not be altered, as an extra large reduction had been made last year to encourage trade. At the end of December, 1921, the charge for gas was 4s. 6d. per 1000 c.ft., so that in fifteen months the price will have been reduced by no less than 1s. 2d. per 1000 c.ft. The reduction means that consumers during the next nine months will pay £20,000 less than they otherwise would.

The Chairman then drew their attention to the more salient figures in the annual statement of accounts. The capital account stands at practically the same as last year, £620,980; being £649 less, due to depreciation on meters and stoves. The total expenditure for manufacture, distribution, management, &c., is £310,867; being the substantial reduction of £70,467 upon last year, of which coal and oil alone account for the greater part of it. They would remember in the previous year there was three months' stoppage of the coal mines, with the result that they were compelled to purchase a large tonnage of imported coal at over £5 per ton. It was well known that gas undertakings relied very largely upon the secondary products produced in the carbonization of coal. The recovery of these bye-products formed one of the principal means of revenue to the coal gas produced, and the sale of these residuals reduced the cost of gas production in a degree corresponding with the efficiency of the recovery methods adopted, and the market value of the bye-products. Contemporaneously with the reduction in the price of coal there had been a substantial reduction in the market value of coal-gas residuals, especially that of coke. For the year 1921 they obtained for residuals, after deducting cost of manufacture, &c., £121,721; while last year the amount received dropped to £93,461, being a decrease of £28,260. They had, of course, saved largely in coal costs during the past year. The receipts for the sale of gas which compared with the figures for 1921 amounted to £15,757, the total amount received from the accounts being £244,792. Rental of meters, stoves, and fittings produced £24,486; the total of residual products, less cost of manufacture, was £93,461; and the net earnings of railway wagons £2888. This, with a small sum of £96 for rents and £16 transfer fees, made a total revenue for the year of £365,739, being £36,253 less than in the previous year. There remained, however, a substantially higher gross profit on the year's working, due chiefly to lower prices of coal and oil. The amount carried to profit and loss account was £54,871, to which required to be added interest on investments £2101, making a total for the year of £56,972.

An interim dividend was paid on the ordinary stock for the June half year in August last of 2½ p.ct., and it was now proposed to pay 4 p.ct. for the December half year, making in all 6½ p.ct., less income-tax, for the year 1922. This would absorb, with the interest on debentures, interim dividend paid, income-tax, &c., £35,316, leaving a balance of £21,656 to carry forward. In the previous year's account, they would perhaps remember they had to draw £11,958 from the undivided balance; so this year they were able to replace it, with an addition of £9698.

Mr. E. S. JOHNSON seconded the resolution, and the motion was carried.

The CHAIRMAN moved that the standard rate of dividend on the consolidated stock be paid at the rate of 4 p.ct. for the December half year, making in all 6½ p.ct., less income-tax, for the year 1922.

Alderman HART seconded this proposition, which was carried.

Mr. J. A. BARRS proposed a vote of thanks to the Chairman, the Board of Directors, Engineers, staff, and employees for their services, which was seconded by Mr. H. MOSEDALE.

Mr. J. FERGUSON BELL (Chief Engineer) said it was most encouraging to have one's services recognized, and he was sure that the vote which had been passed would stimulate the efforts of every member of the staff and employee of the Company. They had a loyal staff who were determined that the traditions of the Company should be maintained. He would like to take this opportunity to state that if any consumers thought their fittings, apparatus, or other gas appliances required attention, or for any reason were not satisfactory, the Company would, as always, gladly send a representative free of charge for the purpose of inspection and advice, and consumers were invited to make known any defects by communicating without delay.

Wallasey Price Reductions.—The Wallasey Gas Committee recommend that the price of gas as registered by ordinary meter be reduced by 3d. per 1000 c.ft., from 3s. to 2s. 9d., as from the next meter readings; that slot-meters—except in special cases—be altered to 26 c.ft. per 1d., without rebate, the new rate to become effective as index-wheels are changed; and that power rates remain as at present.

BRITISH INDUSTRIES FAIR (LONDON).

Following the notice of the Birmingham Section of the British Industries Fair which appeared in the last issue of the "JOURNAL," we now give a few particulars of the exhibits at the London Section, which, as in previous years, was housed in buildings at the White City, Shepherd's Bush. As in the case of Birmingham, the London Section opened on Feb. 19, and closed on Friday last. The attendance was up to expectations, and satisfactory reports were heard of resulting business, especially in the Chemical Section, where, we understand, extensive orders have been placed by overseas customers.

Gas Heating.

While there was no particular group devoted in its entirety to gas, several firms connected with the industry were represented. Gas, too, had quite a large place in regard to the heating arrangements. Throughout the ten sections comprising this Exhibition, gas fires were distributed in series of four arranged round a square base, on the top of which were placed cards bearing the name and makers of the particular fire, and an intimation that the stoves were supplied on hire by the Brentford Gas Company. Among the fires were noticed those made by the firms associated with Radiation, Ltd.; Messrs. R. & A. Main, Ltd.; and Cannon Iron Foundries, Ltd.

This idea of heating is worthy of imitation, as we have recollections of visiting exhibitions held in large buildings where both visitors and attendants were unanimous in their complaints regarding the absence of heating arrangements.

Chemicals and Chemical Plants.

One of the largest sections (Group A) was devoted to chemical plant and heavy and fine chemicals; and as these are chiefly the products of the distillation of coal, it is this group which calls for special notice here. The Gas Light and Coke Company and the South Metropolitan Gas Company displayed an almost endless variety of the various chemicals manufactured by them. A notable feature of the latter Company's stand was a model of Mount Everest—"Metro" pitch being shaped to form the base, with a covering of "Metro" sulphate of ammonia to represent snow. Information was supplied by the Company in regard to some 37 products manufactured by them; details being given as to their properties, specification, and the industrial uses to which they can be put. Special attention was also directed to "Metro" specialities, which comprise coal tar for road work, disinfectants, wood preservative (specially prepared for direct application to outdoor woodwork, and supplied in three shades), and their celebrated dry neutral sulphate of ammonia.

Messrs. Burt, Boulton, and Haywood, Ltd., of Salisbury House, London Wall, E.C. 2, also had a fine display of their numerous manufactures, which included, among others, benzole, toluole, solvent and heavy naphtha, pyridine bases, pitch, refined tar, "Burtumen" (a specially prepared compound from tar for road work, damp courses, &c.), and their well-known "Silvertown" wood preservative and "Ialine" disinfectants. Among some of the firm's new productions may be mentioned wood-preserving stains, sulphur which is miscible in water, and "Plexosote" (an emulsified product consisting of 50 p.ct. water and 50 p.ct. creosote for cheapening the process of wood preserving). The foregoing are emulsions made with the "Premier" mill. The latter is manufactured by the Premier Filter-press Co., Ltd., of Finsbury Pavement House, E.C. 2. This apparatus should be of great interest to all manufacturers desirous of dealing economically with, among others, problems of the following nature: Perfect emulsification of liquids and of liquids and semi-solids; intensive mixing of liquids and solids; minute disintegration of solids suspended in liquids; extraction of tar acids from tar oils, and pyridine from tar oils and naphthas; the acid or alkali washing of benzoles, naphthas, &c.

Messrs. Spencer Chapman and Messel, Ltd., of 36, Mark Lane, E.C., and Silvertown and Bow, showed an assortment of their chemicals, and make a special feature of oleum, which they supply in all strengths.

On the stand of Messrs. Brotherton and Co., of Leeds, were noticed ammonia and tar products, wood dyes, and sodium hydrosulphite.

The British Dyestuffs Corporation, Ltd., of Manchester, on a large and tastefully arranged stand, exhibited a complete range of aniline dyes for all trades; lakes and intermediate products; and a variety of leathers and fabrics which had been dyed by their products. A good display was also shown on the stand of Messrs. Scottish Dyes, Ltd.

The Powell Duffryn Steam Coal Company, Ltd., of Cardiff, showed an extensive variety of products from their coke-ovens, including foundry coke, naphthas, anthracene oil, sulphuric acid, sulphate of ammonia, and "national" benzole (the output of which is disposed of to the National Benzole Company, Ltd.). A model of a tar tree was one of the attractions at this stand.

On the stand of the United Alkali Company was a gas-cooker before and after treatment by their "Maxo" cleaning preparation.

Among the apparatus makers, cast-iron chemical plant lined with acid-resisting enamel was shown by the Cannon Iron Foundries, Ltd., of Deepfields, and by Messrs. T. & C. Clark and Co., Ltd., of Wolverhampton. Messrs. W. C. Holmes and Co., Ltd., of Huddersfield, exhibited photographs of installations of their gas and chemical works plant, including their combined air and water-tube condensers, patent brush washer, sulphate of ammonia plant, valves, &c. Photographs of storage tanks, tar stills, &c., were shown also by the Leeds and Bradford Boiler Company.

Messrs. Wm. Everard, Davies, and Co., of 119, Victoria Street, Westminster, S.W. 1, showed sectional drawings of their vertical retort, and their quick-acting water-heater for either gas or coke. The latter was described in the January issue of the "GAS SALESMAN."

Clockwork Controllers, Burners, and Glassware.

Among the interesting exhibits by the Horstmann Gear Company, Ltd., of Newbridge Works, Bath, were a variety of their "Newbridge" clockwork gas controllers. Attention was directed to the "3/U.N.I." type (8-day run). In this the controller and gas-cock are two separate interchangeable units, which permits of any controller being instantly removed and locked on to any cock of its own type. Another advantage of this arrangement is that the same controller is applicable to either gas or electricity; and, we are informed, it is being exensively used for the dual purpose in Cardiff. The "3 A/U.N.I." has a 14-day run, and as with the No. 3 type, is interchangeable. The gas-cock is fitted to the supply pipe, and remains a permanent fitting. The controller is attached at the side; a key being used to lock it in position—thus preventing theft. The same key is used for winding the mechanism. This arrangement also permits of the controller being removed for repairs without disturbing even the mantle; the latter being left alight or out as desired. The Company also manufacture an auto-adjustment controller, which automatically adjusts the "on" or "off" times daily throughout the year, and has provision for summer and winter time. Another type of controller is made to operate twice in twenty-four hours. In this, the dial carries four tappets, two of which are hinged, and may be put out of action instantly when desired, without removing, unscrewing, or adjusting any part. In addition to gas-controlling devices, the Company also manufacture recording movements, to meet the needs of gas engineers who are fitting up recording instruments in accordance with their own particular requirements, and only purchasing movements and drums. The movements can be made so that the drum will revolve at any interval desired; and drums can be made to fit any chart. The firm are also manufacturers of superheated burners, several specimens of which were on view. Not the least attractive display on the stand was a large assortment of clocks. In connection with this branch of their business, Mr. Horstmann explained to our representative that, in arranging the works for mass production to meet the enormous demand for gas controllers, the Company had been enabled to extend their activities in this direction.

In another section of the Fair, lighting glassware in great variety was shown by Messrs. Ackroyd and Best, Ltd., of Morley, and Mr. John Walsh Walsh, of Birmingham, whose display included some fine specimens of rich cut cobweb patterns, flint satin cut star, cased opal and flint cut, and designs in Florentine ware in various colours.

SOUTH SHIELDS GAS COMPANY.

A satisfactory year in the transactions of the Company was reported at the annual meeting held on Feb. 20, at which Sir JAMES REDHEAD, Bart., presided.

The CHAIRMAN, in moving the adoption of the balance-sheet, said they could have nothing but gratification at the result of the year's working, in spite of a decrease in the sale of gas of 13 p.ct. This latter was not to be wondered at in view of the continued trade depression in their area. With regard to revenue, there had been a substantial decrease of £24,598 in expenditure as compared with the previous year. The revenue account income showed a reduction of £21,889. The receipts from the sale of gas were responsible for £7500 of this decrease; and residual products, principally coke and tar, had yielded £12,916 less than the previous year. With regard to the price of gas for the quarter ended Dec., 1921, the price charged was at the rate of 5s. 6d. per 1000 c.ft. Since that date, in the January and March quarter, they made a reduction of 4½d. per 1000 c.ft.; in the April and June quarter, a reduction of 9½d.; and for the half year ended Dec., 1922, a further reduction of 4⅝d.—making a total reduction during the year equivalent to 1s. 6½d. These reductions represented a saving to the consumers of approximately £47,000 per annum—a startling but a very agreeable figure. In conclusion, the Chairman paid a high compliment to the loyal and energetic support the Directors had had from the officials of the Company. Mr. CURRY (Engineer) and Mr. PICKERING (Secretary) had in particular rendered them excellent and useful service. In proof of this, during the last twelve months they had not had a single dispute in the works. It might be that the fairness shown towards the workmen by the Directors had something to do with it, but he sincerely hoped that good feeling and confidence would continue.

Mr. WALLIS seconded the proposition, which was agreed to.

Col. DAWSON moved that a dividend on the consolidated stock for the half year be declared at 4½ p.ct., making, with the interim dividend, 8½ p.ct. for the whole year; and on the ordinary stock 2¾ p.ct., making, with the interim dividend, 5½ p.ct. for the year.

Mr. HENRY CHAPMAN seconded the motion, which was carried.

Wellington (Salop) Gas Company.

The annual meeting of the Company was presided over by Mr. C. W. Leake (the Chairman). The Directors in their report stated that there was a profit balance of £3816, and they recommended the payment of a final dividend at the authorized rate of 6½ p.ct. on the ordinary stock, making 6¾ p.ct. for the year, less income-tax. The Oakengates Gas Company became merged with the Wellington Company on July 1 last year. The Oakengates Directors, having joined the Wellington Board, the number had been increased from five to eight. The Directors therefore suggested to the proprietors an increase in the existing allowance to £350, free of income-tax, as from the date of amalgamation. The Chairman remarked that considerable addition had been made to the capital account since the last meeting, the principal item being the amalgamation consideration with the Oakengates Company—namely, £14,500 of ordinary stock of the Wellington Company. Notwithstanding this, the capital expenditure per million c.ft. of gas sold still stood at a figure which enabled the Board to look ahead without any misgivings. The amount of carry forward subject to half-year's dividend was considerably reduced when compared with the same period last year. This was due to a transfer of £4318 to special purposes fund, to enable the Board to wipe-out the cost of connecting-up the Wellington works with Oakengates. The Board expected soon to shut-down the Oakengates works as a manufacturing station; by the end of the half year it was hoped to announce a reduction in the charge for gas. Mr. R. J. Milbourne seconded the adoption of the report. This was agreed to, as was also the increase in the Directors' allowance. Hearty thanks were accorded the Manager (Mr. H. J. Woodfine) and the staff.

ALLEGED NUISANCE FROM TORQUAY GAS-WORKS.

Board of Trade Inquiry.

Mr. P. H. HOOPER of the Board of Trade, last Friday at the Torquay Gas Company's office, inquired into a petition signed by a number of ratepayers. Mr. P. H. W. ABNEY appeared for the ratepayers; Mr. E. HUTCHINGS represented the Gas Company; and Mr. J. HARTLEY the Paignton Urban Council. The petition was as follows:

> We earnestly request your special attention to the frequent and serious and damaging nuisance caused by the daily large volumes of black smoke and flakes of carbon, followed by immensely hot and sulphurous fumes, from the Torquay gas-works in our near neighbourhood. The nuisance is injurious to health and vegetation, and damaging to property, and very unfavourable to the letting and saleable value of dwelling houses, and is also a discouragement to visitors; and we view with alarm the possibility of this great nuisance. We, therefore, urgently ask for your consideration of this nuisance with a view to its speedy abatement and discontinuance.

Mr. HUTCHINGS said that, as the Company understood it, this inquiry was held with regard to an objection to an Order which appeared in the Press.

Mr. ABNEY said they did not oppose the amalgamation of the Torquay and Paignton Gas Companies. The whole of the objection was contained in the petition—that if the amalgamation took place, the nuisance was likely to be greatly increased.

Mr. *S. H. Easterbrook*, Secretary of the Torquay Gas Company, said the proposal was that there should be one gas company within the limits of Torquay and Paignton. This was the first complaint to his knowledge. During the past ten years the adjacent property had considerably improved in value. He knew that it had increased threefold since the war. It was impossible to rent a house there to-day.

Answering Mr. ABNEY, witness agreed that Preston, which is adjacent to the gas-works, was being built upon more than any other part of the county, and that it was a very beautiful neighbourhood.

Mr. ABNEY: It is very undesirable that these works should be set-down in this beautiful neighbourhood. Do you not think it would be to the interest of this part if the gas-works were removed?—I think it would be to the interest of the whole world if every gas-works could be removed.

Mr. *W. N. Westlake*, of Exeter, said the method used at the works was orthodox, up-to-date, and properly conducted. The site was a very good one, obscured from view in a valley, and could not be seen from any point on the coast.

Mr. ABNEY: What is the most up-to-date method of cooling the coke when it comes from the retorts?

Witness: By quenching it with water.

Is that the most desirable way?—It is the most usual way.

Is there no other method?—No.

Mr. ABNEY said that large volumes of steam had issued from the coke during this process, and, directed by the wind, must find their way to the houses. He asked Mr. Westlake if he agreed that volumes of smoke were emitted from the retorts.

"Only when they are clinkering their fires," was the reply.

Mr. ABNEY said that if the chimney stacks were raised it would entirely do away with the nuisance.

Witness: I do not agree, because you cannot depend that the wind is going to take the smoke upwards.

Mr. *John Popplestone*, retired builder, of Preston, said he had built all the houses, with one exception, on that road.

Mr. HUTCHINGS: How much depreciation is there in the value of the houses in that road owing to the proximity of the gas-works?

Witness: None whatever.

Do you find it a danger to vegetation?—I always thought the smoke had acted as a tonic.

Have you had any difficulty in selling or letting houses there?—No.

Mr. ABNEY: You think the proximity of the gas-works is an advantage?

Witness: I do not think it is at all detrimental to my property.

Mr. *Chas. H. Mudge*, market gardener, of Preston, said he lived about 20 yards away from the gas-works.

Mr. HUTCHINGS: Have you ever noticed that the crops growing in your garden have been injured by the gas-works?

Witness: No. I have worked the ground since I was a boy.

Have you had any complaints as to the volume of the smoke?—No.

Mr. ABNEY: You refused to sign the petition because you were a tenant of the Gas Company?

Witness: I would not have signed if I was not a tenant of the Gas Company.

Mr. *Percival Davis* said he had no difficulty in growing vegetables.

Mr. ABNEY: You are also a tenant of the Gas Company?

Witness: That is so.

Mr. *Walter George Couldrey*, architect and surveyor, said he had received no complaints from any would-be purchasers. It was well known that the property had doubled and even trebled in value during the last three years. There was not one house vacant now.

Mr. *Robert Beynon*, who has been Manager of the Torquay Gas-Works for over thirty years, contended that the works had been conducted by proper methods, and that the site was suitable.

Mr. ABNEY: The works have been erected sixty years?

Witness: Yes; whether the amalgamation takes place or not, we shall have to extend some time.

How long have the retorts been built? They were built in 1896, and the retort-houses were erected on the most up-to-date lines. They were improved in 1916.

Is your method of charging up-to-date?—Yes.

Mr. ABNEY said there were four retorts drawn every hour, and from each eight barrowloads of incandescent coke were taken. Each load took four minutes to cool down. If the extension took place, there would be twelve loads instead of eight; and he suggested that in the interests of those living in the neighbourhood, the proposal should not be carried out. The chimneys also were on the level with the top of Tarraway Road.

Captain *F. J. Lane* found that during the greater part of 24 hours he was obliged to keep his windows shut owing to smoke.

Mr. ABNEY: How do you find this affects vegetation?

Witness: It is very dangerous.

Are the complaints common in your neighbourhood?—They are.

You and your fellow-petitioners are not opposed to the amalgamation of the Companies?—No. We are prepared to put up with the nuisance as it is; but if the amalgamation takes place, it will be so bad that we shall have to clear out.

Mr. *Joseph Sidney Saville*, also of Tarraway Road, agreed there was a nuisance from the gas-works. The fumes had had a deleterious effect upon things growing in his garden. He had often found it necessary to get out of bed in the night and close the window.

Mr. *Charles Wragg* said the fumes nuisance was intolerable. The carbon from the chimneys pitted all the paint work, and he had picked up in the garden pieces of carbon an inch in diameter. If the chimney at the gas-works was heightened it would greatly reduce the nuisance.

Mr. HUTCHINGS read a letter to the petitioners from the Paignton Council stating that the alleged nuisance was not one in which they could take any action.

Mr. *Wm. Arthur Robinson* said he came to the neighbourhood from Bournemouth. He bought a house; but the nuisance was so bad that he had decided to leave at the first opportunity.

The inquiry then closed.

GAS AND ACCIDENTAL DEATHS.

Good work in the direction of clearing away public misconceptions was done last week by Mr. Ralph Halkett, the General Manager of the Sheffield Gas Company, in the form of an interview with the "Sheffield Daily Telegraph." He put clearly forward the facts regarding the gas danger scare, as they are known to those acquainted with gas-supply matters. After discussing the carbon monoxide question in its various aspects, he went on to quote the following statistics relating to the number of deaths in England and Wales during the year 1921, abstracted from the report of the Registrar-General.

ACCIDENTAL DEATHS.

			Number per Million of Population.
Total number of deaths	11,198	..	296·0
Including deaths due to the following specific causes—			
Coal-gas poisoning (or 0·81 p.ct. of total accidents)	91	..	2·4
Scalds (including steam and hot liquids)	623	..	16·4
Bathing	297	..	7·8
Falling down stairs	596	..	15·7
Falling in the street	124	..	3·3
Falling from a ladder	51	..	1·3
Mechanically propelled vehicles (other than railway trains)	2,053	..	54·2
Horse-drawn vehicles	293	..	7·7
From injury by horse, bull, or cow	83	..	2·2
From excessive heat	247	..	6·5

The following is a list of fatal accidents in the streets of the City of London and the Metropolitan Police Area due to mechanically propelled vehicles (except tramway cars):

1918	455	
1919	543	
1920	525	
1921	465	(Equivalent to 62·3 per million of the population of the area referred to.)

RAILWAY ACCIDENTS.

The total number of deaths due to railway accidents in England and Wales during 1921 amounted to 812. This is equivalent to a death-rate of 21·4 per million of the population.

Swansea's New Gas-Works.

The erection of the new works at Morriston—under the Engineer, Mr. W. H. Johns—is progressing satisfactorily. The 2 million c.ft. holder is already completed, various offices and buildings are in course of construction, and a high-pressure main to connect the two works has been almost completed. It is hoped that gas-making on a more economical basis will be commenced at Morriston next year. This gratifying information Mr. E. H. Leeder was able to give the proprietors, when presiding at the annual meeting of the Swansea Gas Light Company. With regard to the past year's working results, he said the expenditure was £53 745 less than in the previous year, while the receipts were £28,229 less. Unfortunately, the Company, like most other gas undertakings in the country, had been affected by the prevailing industrial depression, with its attendant unemployment; and the normal curve of yearly increase in the amount of gas sold had been deflected, thereby altering the relation of standing charges to the unit of gas sold. It was, however, the endeavour of the Company to sell gas as cheaply as possible, and it was with great pleasure that the Directors had been able to sanction within the past year two reductions in price—namely 2 6d. per therm, as from the end of the March quarter, and a further 0·6d. per therm as from the September quarter. These two reductions were equivalent on the old basis to approximately 1s. 3d. per 1000 c.ft. As a result of being able to sell gas below the basic price, the Company had been entitled to make an allocation of £347 for division among the employee co-partners—the first since June, 1915. Sympathetic reference was made to the death of Mr. George Andrews, whose association with the Company had extended over 41 years. The accounts were passed, and a dividend at the rate of 5 p.ct. per annum on the ordinary stock was declared.

Eastbourne Gas Company.

The meeting of the Company was held on the 26th ult.—Mr. Caleb Diplock presiding. The Chairman, in moving the adoption of the annual report and balance sheet, said they had got a "nice balance-sheet." The total expenditure on capital account was now £211,863, which was equal to £394 per million c.ft. on the sale last year of 532 million c.ft. The capital expenditure at the present time was more by £2767 than at the corresponding time last year. On the thermal side the expenditure amounted to 6s. 8d. per therm. The calorific value had been practically constant. The increase was 0·8 p.ct., compared with a decrease of 4 p.ct. in the report of February, 1922. The declared calorific value was 478 B.Th.U. per cubic foot, and the average of the many official tests of the quality supplied was 485 B.Th.U.; so that all the time the consumers had a better quality than the Company undertook to supply. The number of consumers was now 12,552, or a gain of 220 in the year. Co-partnership had been revived after having been dormant since June, 1917. The Board had allocated £400 to the Fund, and the employees were now keen on making it a success. The allocation was some compensation for having been without bonus for five years, and so there had been less waste and less slackness. As shown, profit earned gave a surplus of £2584, or about a halfpenny per therm. The Board were therefore quite justified in reducing the price of gas per therm for the meter readings in March, making the selling price 11·6d., compared with 14·8d. for the last quarter of 1921—a decrease of 3·2d. per therm, or equal to 1s. 3d. per 1000 c.ft. Mr. Jones seconded the adoption, and said generally the sale of gas during the year had been as big as in 1917, when they had a bumper year. The report was adopted, and dividends declared for the half year ended Dec. 31 last at the rate of 7¾ p.ct. upon "A" stock, 6¼ p.ct. on "B" stock, and 5 p.ct. upon the 5 p.ct. preference stock.

Southend Gas Company.

The half-yearly meeting of the Company was held on Feb. 20. The Chairman (Mr. J. H. Burrows, J.P., C.A.) presided. The Board were in a position at the end of the first quarter of last year to reduce the price of gas by 5d. per 1000 c.ft., again by a similar amount at the end of the third quarter, and now announce a further reduction as from the end of March next by 5d. per 1000 c.ft. in the County Borough, and of 2d. per 1000 c.ft. in the Rochford district of supply. It was recommended that the statutory dividends of £7, £5¾, and £5¼ p.ct. be paid, less income-tax. The Chairman referred to the proposed Board of Trade Order, whereby the Leigh works were to be purchased from the Corporation. Westcliff, or a section of it, during the summer season and at the cooking period of the day in the other seasons had had a short supply of gas, and it was their desire to remedy this. At Christmas in 1919, the first year after the war, they found themselves very deficient in holder accommodation. They had since placed orders for the erection of the foundations for a new holder. The total cost would not work out at less than £56 000, but they had saved £25,000 on what would have been the cost had they proceeded in 1919. The accounts were highly satisfactory. If they compared the 4s. 5d. now paid for 1000 c.ft. of gas with the 3s. 4d. paid before the war, they would see the rise was only 32 p.ct.; and this notwithstanding the fact that coals were twice what they were, oil was twice its former price, and wages were 80 p.ct. above those in pre-war time. Even then the Board were not satisfied and wanted to reduce this 32 p.ct. at the earliest possible moment. They thought it was a very good thing to promote the sale of gas by cheapening it. It was the easiest and the cleanest means of supplying heat, and it was in the interests of every consumer that there should be a cheap supply. He thought that at the new price of 4s. 5d. gas was the cheapest means of heating in the town. The Chairman finally referred with pleasure to the statement in the report as to dividends, and expressed the thanks of the Board to the Secretary, the Engineer (Mr. Thomas F. Canning), and the staff, for the loyal way in which they had co-operated in maintaining the interests of the Company. The report and accounts were passed, and the dividends as recommended approved, on the motion of Alderman Brightwell, seconded by Mr. Talbot.

Watford Gas and Coke Company.

Mr. E. J. Slinn, presiding over the annual general meeting held on Feb. 22, said that, in dealing with the accounts and report for 1922, they would note that the business of the Company had been well maintained, and, despite the general industrial depression, with its corresponding adverse effect on employment, showed a slight increase of nearly 1 p.ct. in the sale of gas compared with 1921. Ordinary and loan capital issued was unaltered for 1922. There was a steady improvement in the gas stock market, largely owing to the general cheapening of money, although the improvement did not approximate to anything like the actual sums paid for the stock originally. Since the accounts were prepared, a better rate of interest had been arranged on a large part of the loan capital. Capital expenditure for the year amounted to £8022. They had a very substantial sum in hand wherewith to push forward new work. Taking the revenue account, there was a marked improvement in the cost of coal and oil, which had enabled them to reduce the price of gas in 1922 by 1s. 2½d. per 1000 c.ft. Management showed a saving of £600, pensions were normal; and while the co-partnership item showed a decrease of £30, he thought they would agree that the sum of £1113 distributed among the employees of the Company was helping them to help themselves against old age and unfortunate circumstances. Turning to the receipts, they would find that, allowing for increased consumption, the consumers of gas alone had been benefited to the extent of £7000. In addition to the decrease of 1s. 2½d. per 1000 c.ft. in 1922 already mentioned, the Directors had announced a further reduction of 1d. per therm, equal to 4¾d. per 1000 c.ft., as from Jan. 1 of this year; and he thought he could promise—strikes, labour disputes, and cost of material permitting—a further reduction in June. After providing for interest on loans, &c., they would note, under profit and loss, a balance of £9683. This would be reduced by £5382, the sum necessary for the payment of final dividends for 1922, leaving £4301 to be carried forward to next account. He moved that the balance-sheet of the Company for the year ended Dec. 31, 1922, showing a profit of £18,601 on the year's working, and the Directors' report, be adopted, and that dividends on the capital of the Company be paid as follows: At the rate of £7 7s. 6d. p.ct. per annum on the "A" capital stock, and at the rate of £5 17s. 6d. p.ct. per annum on the "B" capital stock, and that such dividends be paid less income-tax, and less the interim dividends paid on Aug. 24 last. The resolution was put to the meeting, and carried unanimously. Mr. Birch moved that the Directors' remuneration be increased by £600 per annum free of income-tax, to date from Jan. 1, 1923. Mr. Evetts seconded the motion, which was carried.

Reduction of Nottingham Prices.

Much to the satisfaction of those in Nottingham whose contention was that the price of gas has been maintained at an inordinately high level for too long, the City Council at its meeting on Monday, acting upon the recommendation of the responsible Committee, decided upon effecting substantial reductions. In June last the Council agreed to a decrease of 6d. per 1000 c.ft. in the charges for gas supplied through ordinary meters, and a rebate of a penny in the shilling on that supplied through prepayment meters; such reductions taking effect from the midsummer quarter in the case of ordinary meters and on July 1 in the other category. The Committee now recommended a further decrease of 6d. per 1000 c.ft. for supplies through ordinary meters and an additional rebate of a penny per shilling on that supplied through prepayment appliances, such reductions to come into operation from the date of the reading of the ordinary meters for the Christmas quarter and the collection from prepayment meters as and from Jan. 1 last. They further recommended that a reduction of 25 p.ct. should be made in the rental of cooking-stoves, to come into operation on Lady Day. In moving the adoption of the report, which was agreed to, the Chairman, Alderman A. Ball, said the Committee had taken some risk in making the recommendations, but they felt that, in the interest of the trade of the city, it was most necessary that they should decrease the prices as far as possible. The Committee sincerely hoped that before long they might be able to do something further. Since determining to take this step, the price of coal had substantially strengthened, putting them in rather an awkward position; but it was hoped that further reductions in the near future might be rendered possible. The revised tables, to operate from the periods mentioned, show that the charges will be 3s. 6d. per 1000 c.ft. in cases where the consumption is under a million cubic feet per quarter; 3s. 5d. if a million cubic feet and under four millions; and 3s. 4d. if four millions and upwards per quarter are consumed. For power purposes the charges per 1000 c.ft. will be 2s. 11d. for a consumption of under 100,000 c ft. per quarter; 2s. 10d. for 100,000 and under 200,000; 2s. 9d. for 200,000 and under 300,000; and 2s. 8d. for 300,000 c.ft. or over. For "gassing" purposes, a term applicable to processes in connection with the lace trade, the charge is to be 3s. per 1000 c.ft. for any quantity consumed; for motor vehicles, supplied at the Corporation works, 4s. per 1000 c.ft. with a minimum charge of 1s.; and for gas supplied to garages for re-sale (subject to payment for special meters, services, &c.), 3s. 4d. per 1000 c.ft. The charge for gas supplied through prepayment meters is at the rate of one penny for every 16 c.ft. consumed, less twopence in the shilling rebate. Consumers in certain extra-municipal areas are charged 6d. extra per 1000 c.ft.

Scarborough Gas Company.—The annual meeting was held on Feb. 24, when the report and the usual maximum dividend of 5 p.ct. on all stock were approved. Mr. W. S. Rowntree presided, and, in moving that the report be adopted, said that the item for coal and oil was less by £15,000. Repairs and maintenance of works and plant had increased from £9740 to £11,272. The sale of gas had increased by 1·7 p.ct. He was very pleased to announce that in view of the satisfactory results submitted and their probable repetition this year, certain reductions had been decided upon. As from the March meter readings, the discount for prompt payment of accounts is to be increased from 2½ p.ct. to the old rate of 7½ p.ct., which is equal to a reduction of 2d. per 1000 c.ft., thereby reducing the net price of gas to the low figure of 3s. 3d. A rebate of 2d. per 1000 c.ft. will also be made to prepayment consumers in lieu of the increased discount granted to ordinary consumers. The price of gas in Newby and Scalby is to be reduced as from the last meter readings to the Scarborough rate. Mr. G. A. Moorhouse seconded the adoption of the report, which was approved. Subsequently an extraordinary meeting was held, at which the Directors were authorized to raise additional capital and to seek power to issue redeemable or unredeemable preference stock to the amount of £75,000, and to pay, if necessary, a higher rate of dividend than 5 p.ct.

Cambridge Gas Company.—At the yearly meeting of this Company the Chairman announced that during the current quarter the price of gas was reduced to 9d. per therm, being equivalent to 3s. 6¾d. per 1000 c.ft. This compared with 2s. 7d. per 1000 c.ft. pre-war—an increase of about 38 p.ct., which was described as a very small increase when it was remembered that the cost of living was 80 p.ct. above pre-war. A great increase in the manufacture of gas had made it necessary to spend further capital, and it was stated that within the next year the public would probably be invited to take up more 7 p.ct. shares or mortgage debentures. The Directors recommended the declaration of a dividend at the usual rates, less income-tax, for the half year ended Dec. 31 last. The revenue account for the year showed receipts amounting to £192,722, compared with £194,562 in the previous year, and an expenditure of £164,405, compared with £191,178 in the previous year, leaving a balance to be carried forward to the profit and loss account of £28,317, compared with £3384 in the previous year. The Chairman said that the make of gas had increased by 79 million c.ft., or almost 14 p.ct. over the previous year's make. This great increase brought the Company face to face with still further capital expenditure at the works. The Directors had therefore decided to extend the carbonizing plant by the erection of a new retort-house, for which contracts would be placed in the near future. This expenditure would amount approximately to £30,000.

THE NORTH-EAST COAST COAL TRADE.

From Our Own Correspondent.

There has been little change to report in the situation during the last week. The demand has shown no signs of diminishing, and all qualities are strong and firm. Coking has still been easily in greatest demand. In some cases merchants who had bought gas for future positions have been willing, when collieries can supply either, to agree to take out coking instead at an advance of a shilling or more a ton.

Steams have also continued very strong; and there has been decidedly more inquiry for gas. This is no doubt due in large measure to the big London companies still requiring considerable quantities to complete their contracts for deliveries up to next March. They are reported to have paid 23s. for large quantities of seconds, with perhaps some at 22s. 6d.; while the price for the bulk of specials and best qualities has probably been 23s. 9d. to 24s. They may have to pay 25s. to 26s. to complete their requirements. Quantities are impossible to ascertain.

The three Harton pits which had been out on strike resumed work at the beginning of the week.

The stormy weather, especially at the beginning of the week, naturally caused a certain amount of irregularity in shipping arrivals. Enough, however, has been available to keep the pits fully employed. Any available coal for which the stemmed tonnage was late could easily be disposed of, and probably at far better prices than those at which it had been sold originally.

Coking qualities have been done up to 37s. 6d. It is felt that prices are unlikely to advance very much on this, as America can easily put coal into European ports at lower c.i.f. prices than our current f.o.b. rates and freights permit English merchants to quote. There is, however, plenty of German, French, and Belgian business offering to maintain English prices at a high figure. In addition to this, American quality is still in very bad odour in many parts in consequence of the rubbish which was so often shipped from the States during and after the big strike. One definite sale of 20,000 tons to Holland is reported.

Business for this and next month is still purely a matter for negotiation, with even odd cargoes hard to pick up, and largely depending on collieries' individual positions. Nominal quotations for gas may be said to be 33s. to 35s. for Wear Specials, and best qualities (Holmside, New Pelton, Boldon), and 32s. 6d. for seconds.

YORKSHIRE AND LANCASHIRE COAL TRADE.

From a Local Correspondent.

The past week has witnessed an increased demand for British coal to Germany and Belgium, and collieries are fully sold in respect of all qualities for some months ahead. Apart from the rush of business on account of these two countries, the trade with other Continental markets is more active. At Sheffield, furnace and foundry coke consumers experienced some difficulty in obtaining supplies by reason of the heavy tonnages going to export. Generally speaking, the demand for furnace coke was erratic, owing to the question of time of shipment. The bad weather of the last fortnight created a better demand for house coal; but merchants have no difficulty in meeting requirements, and prices have not increased. Gas coke has been scarce, and prices will doubtless rise. Coal prices generally rule firm in Yorkshire, and last week were quoted f.o.b. Hull as follows: Best South Yorkshire hards, 32s.; West Yorkshire Hartleys, 28s.; washed doubles, 30s. to 31s.; washed singles, 30s.; South Yorkshire rough slack, 20s.; smalls, 14s. 6d. per ton. Apart from offers by merchants there is not a big amount in the open market. At Barnsley, best kinds were at the week-end firmly quoted at about 33s. per ton f.o.b. for prompt business. The demand for secondary fuel was keener, and values had increased to 28s. per ton f.o.b. over the export season. The home demand was stronger, particularly on behalf of the railway companies. The export inquiry for gas coal has caused values to advance considerably. The Lancashire markets are, on the whole, rather better than they were. In industrial coal there is better business moving; and for screened steam coal 23s. to 25s. per ton is quoted at the pits. Slacks are rather scarce and firm, and a good deal is now being consumed by the coke-ovens. Prices for furnace coke are inclined to be dearer.

COAL TRADE IN THE MIDLANDS.

From Our Local Correspondent.

The past week has been featureless so far as trade in the Midlands is concerned. With an improvement in the weather, the traffic disorganization has been overcome. Gas-works and the big industrial consumers are getting their deliveries regularly from the collieries. The only qualification that has to be made refers to coke. Some of the blast-furnace owners allege that they are being harassed not only by the difficulty of securing additional supplies, but by unpunctuality in delivering those contracted for. The stringency has become more acute. It is as pronounced in connection with gas cokes as with furnace sorts. In the best foundry qualities the effects of the prevailing shortage are not so marked as in other departments. While fuel values generally have tended to stiffen during the week, there have been no transactions in gas coal by which the strength of the market could be tested. Generally speaking, consumption needs are well covered by contracts, and works managements are content to await developments. In the less regular branches of the trade, shortage of wagons causes occasional intermission of supplies; operations at the pits having to be temporarily suspended now and again for want of the necessary distributive facilities. The rolling-stock makers are receiving an increasing number of orders from collieries and private traders who are anxious to reinforce their resources.

TRADE NOTES.

Water-Heating.

We have received from Messrs. Ewart and Son, Ltd., of Euston Road, London, N.W. 1, their latest catalogue of geysers and water-heaters, giving the reduced prices now in force and much general information on the subject of water-heating. The catalogue is prepared with the same care and precision which characterizes the various types of water-heaters manufactured by this renowned firm. The "Radion" circulator is described; and a description of a gas-heated copper possessing many novel features forms part of the contents of this new booklet. An article dealing with the employment of Ewart's apparatus for water-heating will appear in the March issue of "The Gas Salesman."

Messrs. Firth Blakeley, Sons, & Co., Ltd.

A small illustrated booklet bearing the title "What We Make" has been sent to us by Messrs. Firth Blakeley, Sons, & Co., Ltd., Gas, Chemical, and Constructional Engineers, Vulcan Ironworks, Church Fenton, Yorkshire. This firm manufacture and erect every description of gas-making apparatus; coke-oven and bye-product and tar-distilling plant; oil, benzole, and petroleum storage tanks; and structural steel work. The first illustration is a bird's eye view of the works and erecting yard, and gives some idea of the rapid development which the works have undergone in recent years. This is followed by a series of photographs of some of the plant, which includes ammonia scrubbers, purifiers, and several types of gasholders, they have supplied and erected in various parts of the country.

Gas Plant and Other Products.

The above is the title of a well-conceived and comprehensive catalogue which we have received from Messrs. Clapham Brothers, Ltd., of Keighley. It possesses a valuable feature not usually given in gas-works contractors' catalogues, in that the main over-all dimensions to the inlet and outlet branches, &c., of all standard sizes of plant are included. The weights of various types of apparatus of all capacities, in working order, are also supplied—information which the makers hope will prove extremely useful to those engineers who may be preparing a new lay-out. Indeed, the governing idea throughout the booklet has been to make it useful as an engineer's reference. The pages are printed on one side only, the other side providing a convenient space for memoranda relating to any particular type of plant. This catalogue has been sent to all works in the British Isles having an annual make of 25 million cubic feet and upwards. If any engineer has been inadvertently missed, Messrs. Clapham Brothers will be pleased to forward a copy on receiving a communication from him.

Chichester Gas Company.—Mr. W. A. Walker, moving the adoption of the report and accounts at the half-yearly meeting of the Company, said that a good deal of work necessary in connection with the distributing plant had involved a considerable expense in the revenue account. The balance standing to the credit of the profit and loss account (net revenue) amounted to £5406, which, after paying the dividend recommended, would leave £3838. He was able to announce a third reduction in the price of gas of 1½d. per therm, or 7d. per 1000 c.ft. There had been a slight falling-off in the quantity of the gas sold. The total income from all sources was £14,234, compared with £16,391 a year ago, a reduction of £2157. This, after taking into account the reduced expenditure of £2156, left them with practically the same balance of profit as a year ago. The report and accounts were adopted, and a dividend was declared at the rate of 10 p.ct. on the "A" stock, and 7 p.ct. on the "B" and "C" stocks. A vote of thanks to the Directors and staff was acknowledged by the Chairman, Mr. T. N. Ritson (Engineer), and Mr. V. V. Vick (Secretary).

South Staffordshire Mond (Power and Heating) Gas Company.—Mr. G. Macpherson presided at the annual meeting of the Company, and, in moving the adoption of the report, stated that, notwithstanding the depressing conditions prevailing in the district during the whole of last year, there was a net profit of £5176; and there was now an improvement in the demand for gas. The consumption of fuel was 19·4 p.ct. less than in 1921, but the output of sulphate of ammonia decreased only 8·96 p.ct. Improvements and economies in working gave an all-round increase in efficiency. There was an increase in the sales of disinfectants and other products; and it was to this fact that the profit was mainly due. The decreased cost of fuel amounted to £51,668. The gas sold was 5·53 p.ct. less than in 1921, and the revenue from gas £30,874 less. Subsequently a special meeting was held in reference to the Bill which is being promoted by the Company. Under the provisions of their 1901 Act, the Company were prohibited from supplying gas for illuminating purposes or for use in dwelling-houses. The Company now ask to be allowed to sell gas in bulk to other distributors, for mixing with their own gas. It has been found that a mixture of equal parts of Mond gas and town gas gives a very good light with an inverted incandescent burner.

Bristol Gas Company.—The ordinary general meeting of the Company was held on Feb. 15—Mr. James H. Howell presiding. In moving the adoption of the report and accounts for the past year, the Chairman said they would agree that they were highly satisfactory, as not only had they earned their statutory dividend of 5 p.ct., but had also a substantial balance to be carried forward. They confidently hoped to effect a further reduction in the price of gas during the coming summer. The price of gas, owing to a series of reductions, was only 8d. per therm, which was equal to 3s. 2½d. per 1000 c.ft. Turning to the accounts, they would see that the cost of coal, oil, carbonizing, purification, repairs, and maintenance, which in 1921 amounted to £100,416, was in 1922 £88,426. On the credit side the revenue from the sales of gas had fallen from £703,896 to £610,359. Residuals which in 1921 had realized £220,000 had fallen to £170,000 in 1922. The net result was a very satisfactory balance to be carried forward. The Chairman moved that a dividend be declared for the half year ended Dec. 31, 1922, at the rate of £5 p.ct. per annum on the nominal capital of the Company entitled to dividend, subject to the deduction of income-tax. Mr. Fenwick Richards seconded, remarking that he thought the report and accounts were satisfactory to them all.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *March* 5.

The market for tar products maintains a firm tone. There has been a further advance in pitch since the last report, and the value is said to be approaching 170s. per ton. Creosote continues in demand, and is firm at from 9¼d. to 9½d. per gallon at makers' works. Solvent naphtha 95-160 and pure benzole are about 2s. per gallon, filled into buyer's drums. There is rather more inquiry for pure toluole, and the price is rather firmer at about 2s. 3d. per gallon. Phenol is a little higher at from 1s. 3d. to 1s. 4½d. per lb. Other products are without change.

Tar Products in the Provinces.

March 5.

The average values for gas-works products during last week were: Gas-works coal tar, 103s. to 108s. Pitch, East Coast, 165s. to 170s. f.o.b. West Coast—Manchester, 160s. to 165s.; Liverpool, 161s. to 166s.; Clyde, 165s. to 170s. Benzole 90 p.ct., North, 1s. 7½d. to 1s. 8d.; crude 65 p.ct. at 120° C., 1s. 0½d. to 1s. 1d. naked at makers' works; 50-90 p.ct., naked, North, 1s. 8d. to 1s. 8½d. Toluole, naked, North, 1s. 11d. to 2s. nominal. Coal tar crude naphtha in bulk, North, 8½d. to 9d. Solvent naphtha, naked, North, 1s. 8d. to 1s. 10d. Heavy naphtha, North, 1s. 6d. to 1s. 8d. Creosote, in bulk, North, liquid, 8½d. to 8⅝d.; salty, 7½d. to 8d. Scotland, 7d. to 7½d. Heavy oils, in bulk, North, 7d. to 7¼d. Carbolic acid, 60 p.ct., 3s. 6d. to 4s. Naphthalene, £15 to £16; salts, £6 to £8, bags included. Anthracene, "A" quality, 4d. per minimum 40 p.ct., purely nominal; "B" unsaleable.

FROM A MARKET CORRESPONDENT.

Bye-Products Trade.

The market in tar products remains without much change. Features are, however, again provided by pitch and carbolic acid. A very strong position is reported in the first-named, and values are higher. Continental inquiries are to hand for next season's shipment; but maker's prices are not considered low enough. South Wales patent fuel makers are doing nothing beyond waiting the arrival of the large quantities of American pitch which they have secured. The first consignments are now about due. Carbolic acid is a strong spot; and crude has advanced considerably. The export demand for crystal continues; but stocks are practically non-existent. Naphthalenes have improved on better inquiry, especially for crudes. Solvent naphtha is quiet and without much change. Benzole and toluole are on the weak side, after early improvement.

The range of quotations is as follows:

Benzole: 90% London 1s. 9d., North 1s. 8d. Pure 2s. 3d.
Crude Tar: 77s. 6d. to 80s. Refined, 40s. per barrel (free) on rail.
Pitch: London, 160s. to 170s. per ton; East Coast, 165s. per ton; West Coast, 150s. to 160s., with Manchester 155s. per ton, and Glasgow 155s. per ton; South Wales, 160s. per ton.
Solvent Naphtha: London, 1s. 10d. Provinces average 1s. 7d. per gallon.
Crude Naphtha: Naked, 10d. per gallon.
Heavy Naphtha: 1s. 8d. per gallon.
Naphthalene: Refined, £15; inferior, £13; crude, £4 10s. to £8, according to quality.
Toluole: Naked, 2s. 5d. North, 2s. 4d.
Creosote: London, 7⅞d. to 8¼d.; North, 7¼d. to 7⅜d.
Anthracene: 40-45%, 4d. per unit per cwt.
Pyridine: 10s. per gallon.
Aniline Oil: 11d. per lb., drums extra.
Aniline Salts: 10d. per lb.
Cresylic Acid: 95%, 2s. 9d. to 2s. 10d.; 97-99%, 2s. 10d. to 2s. 11d. per gallon *ex* works London, f.o.b. other ports.
Carbolic Acid: Crude 60%, 2s. 8d. per gallon; crystals 40%, 1s. 2d. per lb.
Salicylic Acid: Technical, 1s.; B.P., 1s. 6d. per lb.
Xylol: Pure, 2s. 9d.; commercial, 2s. per gallon.

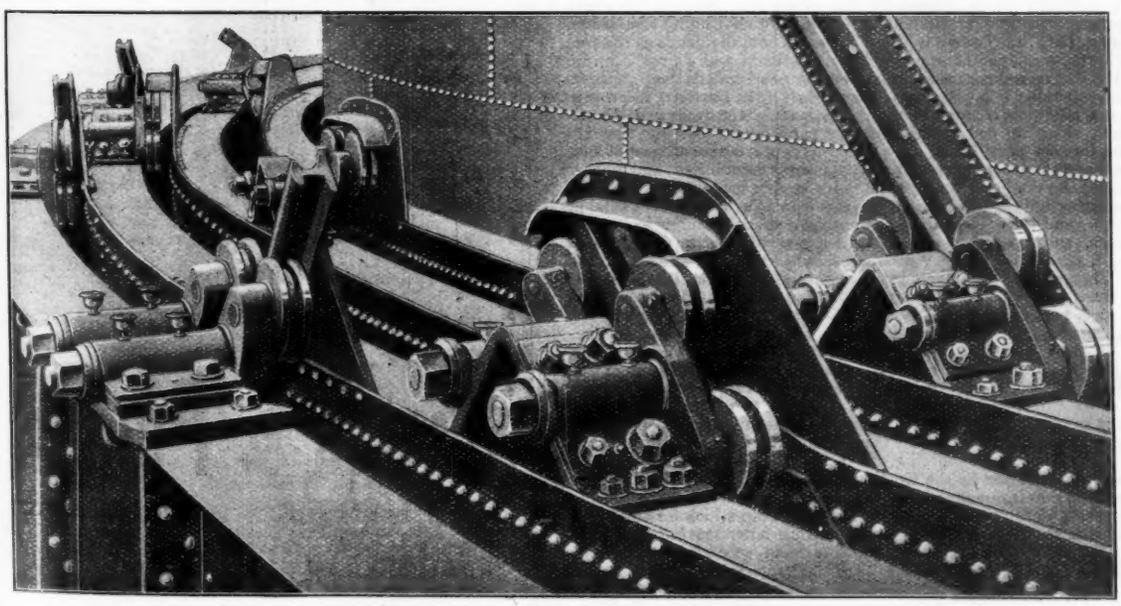
Sulphate of Ammonia.

The position of sulphate of ammonia here changes very slightly. Export demand is growing satisfactorily, and prices continue to advance. Home prices are without change.

Darwen Price Reduction.—At a meeting of the Darwen Gas Committee last week, it was decided to reduce the price of gas from 4s. 10d. to 4s. 4d. per 1000 c.ft., to take effect from Jan. 1 last.

Fleetwood Gas Company.—At the half-yearly meeting of the Company—Mr. William Rogerson (the Chairman) presiding—a profit of £1581 (reduced by loan interest to £1133) was recorded. Dividends of 7½ p.ct. per annum were declared on the preference stock and 5 p.ct. on the ordinary stock, less tax. Mr. J. A. Cleator has been appointed Secretary of the Company. Last year 71,492,000 c.ft. of gas were sold.

Cleveland Gas Company.—The half-yearly meeting of the Cleveland Gas Company was held at Saltburn on Thursday, Feb. 22, Major E. Hamilton, J.P., presiding. The Directors reported a profit of £450 12s. It was decided that this sum should be carried to next half-year's account, and that no dividend should be paid. The report stated that towards the end of the half year an improvement took place in the Cleveland mining industry. It was hoped that if this continued it would lead to a larger consumption of gas than recently, with a consequent improved result from the Company's operations.



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APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for Feb. 28.]

Nos. 4718 to 5469.

Bland Light Syndicate, Ltd.—"Incandescent gas burners." No. 5095.
Brice, A.—"Controlling gas-cookers." No. 5415.
Buchanan, H.—"Means for manufacture centrifugally of pipes, &c." Nos. 5375, 5376.
Charles, W. J.—"Gas-taps and regulators of incandescent burners." No. 4886.
Dolphin, J —"Gas valves." No. 4907.
Duckham, Sir A. M.—"Annular muffle furnaces, &c." No. 5348.
Fildes, T. R.—"Geysers, &c." No. 5028.
Flavel, P. W.—"Gas-stoves." No. 5245.
Hermon, E. E. & R. E. H.—"Illuminating apparatus." No. 5297.
Howlett & Co., Ltd., M.—See Dolphin, J. No. 4907.
Jones, A. J.—"Plug cocks for gas, &c., burners." No. 5261.
Keith, G., and Keith and Blackman Co., Ltd., J.—"Tubular burners." No. 5177.
Keith, G., and Keith and Blackman Co., Ltd., J.—"Gas-burners." No. 5178.
Keith, G., and Keith and Blackman Co., Ltd., J.—"Injector." No. 5179.
Keith, G., and Keith and Blackman Co., Ltd., J.—"Automatic temperature control apparatus." No. 5180.
Keith, G., and Keith and Blackman Co., Ltd., J.—"Combined compressing and mixing apparatus." No. 5182.
M'Neill, D.—"Means for preventing explosions in gas-fired furnaces when lighting same." No. 4910.
Meters, Ltd.—"Prepayment gas-meters." No. 5020.
Miles, R.—"Gas-producers." No. 5210.
Moir, D.—See Buchanan, H. Nos. 5375, 5376.
Monarch Mantles, Ltd.—"Inverted gas-mantles." No. 5337.
Orme, T. A.—See Meters, Ltd. No. 5020.
Pickard, W.—"Production and utilization of gases for internal-combustion engines." No. 4888.
Rogers, R. J.—"Incandescent gas-burners."—No. 5095.
Scott, W.—"Apparatus for controlling flow of liquid or gas." No. 5170.
Smith, A., and Smith Meters, Ltd.—"Valve mechanism for prepayment gas-meters." No. 4922.
Soper, J. P. H.—See Monarch Mantles, Ltd. No. 5337.
Stansfield, A.—"Prepayment gas-meters." No. 5020.
Sumpton, A. J.—"Lighting arrangement." No. 4846.
Taylor, A —"Flexible joint for conduit-threading, gas-main clearing, &c." No. 4778.
Woodall, Duckham, and Jones (1920), Ltd.—See Duckham, Sir A. M. No. 5348.
Yates, H. J.—See Dolphin, J. No. 4907.

Grays and Tilbury Gas Company.

The ordinary yearly general meeting of the proprietors of the above Company was held at Kennan's House, Crown Court, Cheapside, London, E.C., on Thursday, Feb. 22, when final dividends at the rate of £8 10s. p.ct. per annum on the "A" shares, and £5 19s. p.ct. on the "B" shares, less income-tax, for the year ended Dec. 31, 1922, were declared. The Chairman (Lieut.-Col. F. E. Bartlett), in proposing the adoption of the report and balance-sheet, reviewed the accounts, which showed that the balance carried to profit and loss account for the year (after providing for depreciation of gasholders, meters and stoves, suspense account, old works demolished, and placing £1625 to the credit of the renewal fund) is £13,591, which, with the balance brought forward from last year—viz., £2774—makes a total of £16,366, and, after providing for interest on debentures and other charges, and the payment on Sept. 1 last of interim dividends of 6½ p.ct. per annum on the "A" shares and 5½ p.ct. per annum on the "B" shares (both less income-tax) amounting to £3160, there remains a balance of £6719 available for distribution. The dividends declared as above, together with the interim dividend paid in September last, made an average distribution of £8 p.ct. and £5 12s. p.ct. (less income-tax) on the "A" and "B" shares respectively for the year, leaving a balance of £3137 to be carried forward. He congratulated the shareholders upon the year's working, which, he was sure they would agree, was satisfactory, and he was pleased to be able to inform them that the Company were making steady progress. The number of consumers upon the Company's books had increased during the year under review by 358. Considerable building was taking place in practically all parts of the district served by the Company, and in view of the development of the riverside frontage (twenty-four miles of which is included in the Company's statutory area of supply) the Directors look forward with confidence to the increase in output which must inevitably follow. Mr. Courtenay C. S. Fooks (Deputy-Chairman) seconded the motion, which was carried unanimously. On the proposition of Mr. R. L. Norris, seconded by Mr. C. F. Squires, a hearty vote of thanks was accorded the Directors for their management of the Company's affairs. The Chairman having responded on behalf of the Board, Mr. J. C. Wright moved that a hearty vote of thanks be accorded to the Engineer (Mr. A. W. Sumner), the Secretary (Mr. W. F. Whittaker), the staff, and the workmen for their services. The Chairman, in seconding the motion, bore testimony to the efficient manner in which the whole of their duties were discharged.

Farnworth and Kearsley Gas Company.—Mr. W. Watson, J.P. (the Chairman), alluded, at the half-yearly meeting, to the expenditure on capital account, the chief item being for the extension of mains and services and providing meters to the housing schemes of Farnworth and Kearsley. All gas now supplied was charged by the therm. The price of gas has been reduced 6d. per 1000 c.ft. to ordinary consumers; and a further reduction of 0·63d. per therm net, equal to 3d. per 1000 c.ft., will come into operation after the March quarter.

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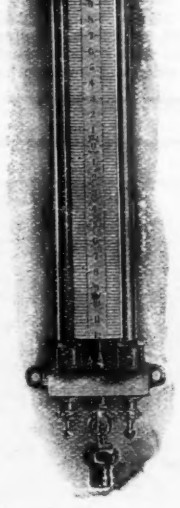

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STOCK MARKET REPORT.

THE Stock Exchange has not had a very satisfactory week. As a rule, the daily tendency varied frequently in the different markets, and a brighter prospect would be arrested by a wave of profit-snatching or a cloud of Continental selling. This enjoined caution on the part of operators, and markets fell very quiet, with a dull close. The gilt-edged market was not exempt; but Home Governments stood it pretty well—the big four on Friday marking thus: Consols 57⅜ 58, War Loan 101-101¼, Funding 88¼-88⅜, Victory 89⅝-90⅛.

Home Rails were rather weaker, and Canadian were firmer; but Argentine were wanted.

The Foreign Market moved capriciously. Turks and Russians were in demand for awhile, but gave way at last.

Business in the Gas Market was fairly active, and the tone was generally very steady, with fewer changes than in the week before. In the London Companies, Gas Light ordinary and debenture rose 1 each, and the preference ½. In the Suburban and Provincial group, British preference rose 1, Croydon sliding-scale 3, Maidstone 23, Tynemouth 1½. Abroad, Imperial Continental rose 10, and Cape Town debenture 1. Primitivas were fractionally easier.

The following transactions in gas during the week were recorded: On Monday, Bournemouth "B" 11½, 11$\frac{9}{16}$, Brighton and Hove ordinary 123¼, Commercial 4 p.ct. 93½, European 7⅞, 7$\frac{15}{16}$, Gaslight ordinary 93¼, 93½, 93⅜, 94, ditto 3½ p.ct. maximum 63⅜, ditto 4 p.ct. preference 78½, Imperial Continental 156½, 157, 158, Monte Video 54, Primitiva 5 p.ct. preference 47s., 48s. 9d., South Metropolitan 94, 94¼, ditto 3 p.ct. debenture 62, ditto 6½ p.ct. debenture 106⅛, South Suburban 98, 98⅛, Wandsworth Wimbledon 95, Barnet "D" 113, ditto 4 p.ct. debenture 78. On Tuesday, Bombay 93s. 9d., Commercial 4 p.ct. 95½, ditto 3½ p.ct. 94, 95⅛, ditto 3 p.ct. debenture 57½, Continental Union 21, European 7⅜, 8, Gas Light ordinary 93, 93¼, 93⅛, 93⅜, 93⅞, 94, ditto 3½ p.ct. maximum, 63¾, 64⅛, ditto 3 p.ct. debenture 60⅜, 62, Imperial Continental 156½, 156⅝, 157, 158, Maidstone 109½, 110, Malta and Mediterranean 65s., 70s., Ottoman 10s., Primitiva 10s., 12s., 12s. 6d., ditto 5 p.ct. preference 40s., 42s. 6d., 46s. 3d., 48s., ditto 4 p.ct. 1911 debenture 55⅛, 58, South African 7⅜, South Metropolitan 93½, 93⅝, 94, 94⅛, ditto preference 95, Tottenham "B" 98½, Aldershot 7 p.ct. debentures 100⅛, 100⅜, Croydon 5 p.ct. debenture 92, 92½. On Wednesday, Aldershot preference 67, Bombay 96s. 3d., Brentford "A" 97, Commercial 4 p.ct. 95½, 96, ditto 3 p.ct. debenture 57, European 7⅜, Gas Light ordinary, 93½, 93⅝, 93½, 93⅜, 94, 94⅛, ditto 3 p.ct. debenture 61, Liverpool ordinary 88⅞, ditto 7 p.ct. preference 105⅛, Portsea "C" 98½, 99, Primitiva 10s., 12s., ditto 5 p.ct. preference 38s. 9d., 40s., 41s., 41s. 3d., 42s., South Metropolitan 93½, 94⅛, 94⅜, 94⅛, Tottenham "B" 99½, Aldershot 4 p.ct. debenture 70½, Barnet "D" 113, Southend 5 p.ct. new 81, 81⅛, Harpenden District 7 p.ct. debenture 98½, 100. On Thursday, Alliance and Dublin 61, 61⅜, Bombay 97s. 6d., Bournemouth 5 p.ct. 11½, ditto 6 p.ct. preference 9$\frac{15}{16}$, Bristol 90⅜, Cape Town 4½ p.ct. debenture 74, 75, Continental Union 23, Croydon maximum dividend 82½, 84, European 7⅜, 8, Gas Light ordinary 93½, 93⅜, 93⅝, 94, 94⅛, 94½, ditto 3 p.ct. debenture 61½, Imperial Continental 163, 163⅜, 164, 165, 165½, 166, 167, Liverpool 7 p.ct. preference 106⅛, Newcastle 82½, ditto 4 p.ct. preference 76⅜, Primitiva 10s., ditto 5 p.ct. preference 40s., 40s. 3d., 40s. 6d., 41s., ditto 4 p.ct. 1911 debenture 58½, South Metropolitan 94, 94⅛, 94⅜, ditto 3 p.ct. debenture 61, Tottenham "B" 100, 100½, Brighton and Hove 6 p.ct. preference "B" 100, ditto 7 p.ct. debenture 102½, 102⅜, Guildford Cons. 75. On Friday, Aldershot "C" 75⅞, 76½, Alliance and Dublin 60½, Bombay 95s., 97s. 6d., 98s. 6d., Bournemouth 5 p.ct. 11½, 11$\frac{9}{16}$, ditto 6 p.ct. preference 9⅜, 9⅞, Brentford "A" 97, ditto 4 p.ct. debenture 78½, British 40⅛, Commercial 4 p.ct. 95⅝, Continental Union 22½, Gas Light ordinary 94, 94⅛, 94⅜, 94⅜, 94⅞, ditto 3½ p.ct. maximum 64⅛, 64½, ditto 4 p.ct. preference 78½, 78¾, 79, 79⅜, ditto 3 p.ct. debenture 61, 61⅛, 62, Primitiva 11s., ditto 5 p.ct. preference 39s. 4½d., 40s., 40s. 3d., 41s. 3d., South Metropolitan 94, 94⅛, 95, Tottenham "B" 100, Barnet 4 p.ct. debenture 77½, Folkestone 77, 77½.

In the Money Market, sharp demands and intermediate relaxation varied almost from day to day; but the close was easy. Discount moved sympathetically. Silver moved irregularly, but closed at an advance. The Bank of England rate was 3 p.ct., as fixed on July 13.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S TRANSACTIONS.

Issue.	Share.	When ex-Dividend.	Ante-War Dividend & Bonus.	Last Dividend.	NAME.	Closing Prices, July 30, 1914.	Present Prices.	Lowest and Highest Prices of Transactions.
£			p.c.					
131,978	Stk.	Feb. 22	—	5%	Aldershot 5 p.c. max. C.	..	74—79*	75½—76½
190,492	,,	,,	4	4%	Do. 4 p.c. Pref.	..	66—71*	67
1,551,868	,,	Oct. 5	2½	5%	Alliance & Dublin Ord.	59—64	59—64	60½—61½
374,000	,,	Jan. 11	4	4%	Do. 4 p.c. Deb.	76—79	60—65	...
280,000	5	Oct. 19	7½	4/-	Bombay, Ltd.	5⅛—6⅛	4⅛—5	93/9—98/6
100,000	5	Feb. 22	16	8/-	Bournemouth Gas and Water { 5 p.c.	..	11—12*	11⅛—11$\frac{9}{16}$
583,110	10	,,	7	7/-	Bournemouth Gas and Water { B 7 p.c.	15—15½	11—12*	11⅛—11$\frac{9}{16}$
115,000	10	,,	6	6/-	Bournemouth Gas and Water { Pref. 6 p.c.	13½—14	9—10*	9⅛—9⅜
162,065	—	Dec. 29	—	4%	Bournemouth Gas and Water { 4 p.c. Deb.	..	71—76	...
992,045	Stk.	Feb. 22	14	6/-	Brentford A Consolid.	261—266	93—98*	97
734,920	,,	,,	11	6/3	Do. B New	204—209	93—98*	...
55,000	,,	,,	5	5%	Do. 5 p.c. Pref.	109—111	85—90*	...
221,400	,,	Dec. 14	4	4%	Do. 4 p.c. Deb.	91—93	75—80	78½
214,775	,,	Aug. 24	11	11%	Brighton & Hove Orig.	208—213	165—170	...
244,200	,,	,,	8	8½%	Do. A Ord. Stk.	154—159	120—125	123½
1,272,500	Stk.	Feb. 22	5	5%	Bristol 5 p.c. max.	..	91—92*	90½
570,000	20	Oct. 5	12½	22/6	British	44—45	38—43	40½
10,000	10	Dec. 29	—	7/-	Do. 7 p.c. Pref.	..	12—13	...
120,000	Stk.	June 29	4	4%	Do. 4 p.c. Deb. Stk.	88—90	75—80	...
220,135	,,	Dec. 29	4	4%	Buenos Aires 4 p.c. Deb.	85—87	53—58	...
100,000	10	Nov. 2	—	—	Cape Town & Dis., Ltd.	1⅛—2⅛	6⅛—7⅛	...
100,000	10	Oct. 19	—	—	Do. 4½ p.c. Pref.	4—6	6—7	...
100,000	Stk.	Dec. 29	4½	—	Do. 4½ p.c. Deb. Stk.	70—75	72—77	74—75
237,860	,,	,,		7½%	Cardiff 7½ p.c. Deb.	..	102—104	...
157,150	,,	Feb. 26	5	5%	Chester 5 p.c. Ord.	108—110	..	...
1,513,280	,,	July 27	5/9/4	56/-	Commercial 4 p.c. Stk.	106—108	95—98	93½—96
360,000	,,	,,	3½	55/-	Do. 3½ p.c. do.	103—105	95—98	94—93½
475,000	,,	Dec. 14	3	3%	Do. 3 p.c. Deb. Stk.	69½—71½	55—60	57—57½
800,000	,,	Dec. 15	4	—	Continental Union, Ltd.	76—79	19—24	21—23
200,000	,,	Dec. 14	7	4%	Do. 7 p.c. Pref.	115—118	55—60	...
660,000		Sept. 1	—	6%	Croydon sliding scale.	..	100—105	...
284,975		,,	—	5%	Do. max. div.	..	81—86	82½—84
492,270	Stk.	—	6	4½%	Derby Con. Stk.	123—125	..	...
55,000	,,	—	4	4%	Do. Deb. Stk.	102—104	..	...
209,000	,,	Oct. 5	—	5%	East Hull 5 p.c. max.	..	..	...
1,002,180	10	Jan. 25	10	5/0	European, Ltd.	17½—18	7⅛—8⅛	7⅛—8
16,546,120	Stk.	Feb. 8	4/17/4	52/-	Gas Light and Coke { 4 p.c. Ord.	98—102	93—95	93—94⅛
2,600,000	,,	,,	3½	35/-	Gas Light and Coke { 3½ p.c. max.	76—79	63—65	63⅛—64⅛
4,062,235	,,	,,	4	4%	Gas Light and Coke { 4 p.c. Con. Pref.	96—99	78—80	78⅛—7⅛
4,761,930	,,	Dec. 14	3	3%	Gas Light and Coke { 3 p.c. Con. Deb.	72⅛—74⅛	60—63	60⅛—62
130,000	,,	Dec. 11	10	10%	Gas Light and Coke { 10 p.c. Bonds	..	..	...
	—	—	—	—	Gas Light and Coke { 7½ p.c. Ilford Deb	..	..	...
82,500	,,	Sept. 21	5	65/7½	Hastings & St. L. 5 p.c., Do. 3½ p.c.	..	95—100	...
258,740	,,	,,	3½	50/7½	Do. 3½ p.c.	87—89	77—80	...
70,000	10	May 18	11	7½%	Hongkong & China, Ltd.	16½—16⅝	6—7	...
86,600	Stk.	Aug. 24	9	9%	Hornsey 7 p.c.	..	130—135	...
1,976,000	,,	Nov. 16	9	£5	Imperial Continental	150—160	163—168	156½—167
404,800	,,	Feb. 8	3½	3½%	Do. 3½ p.c. Deb. Red.	84—86	73—78	..
235,242	,,	July 27	6½	6½%	Lea Bridge Ord. 5 p.c.	119—121	95—100	...
2,498,905	,,	Feb. 26	10	37/6	Liverpool 5 p.c. Ord.	..	..	88⅛
600,000	,,	Sept. 21	—	7%	,, 7 p.c. Pref.	..	105—107	105⅛—106½
165,736	,,	Feb. 22	7/5/6	80/-	Maidstone 5 p.c.	..	107—112*	109½—110
63,480	,,	Dec. 29	—	3%	Do. 3 p.c. Deb	..	53—58	...
75,000	5	June 29	6	6%	Malta & Mediterranean Met. of Melbourne { 4½ p.c. Deb.	4⅛—4⅜	3⅛—3⅜	65/—70/-
100,000	100	Oct. 2	4½	4½%	Monte Video, Ltd.	99—101	97—100	...
541,920	Stk.	Nov. 30	4	4%	Newcastle & Gatsh'dCon.	11½—12	50—55	54
1,875,892	,,	Feb. 22	4⅛	4⅛%	Do. 4 p.c. Pref. Stk.	98½—99½	81—82*	82½
230,166	,,	,,	—	4%	Do. 3½ p.c. Deb.	..	74—79*	76½
529,705	,,	Dec. 29	3½	3½%	North Middlesex 10 p.c.	82—83	68—69	...
15,000	10	Aug. 26	—	7/6	,, 7 p.c.	..	..	...
55,940	10	Aug. 24	7/14/0	7/8⅜	Oriental, Ltd.	14—15	10⅛—11⅛	...
300,000	Stk.	Nov. 30	8	8%	Plym'th & Stonh'se 5 p.c.	117—122	95—100	...
188,120	Stk.	Dec. 29	—	72/6	Portsea Island, B	..	94—99	...
60,000	50	Aug. 24	13	65/-	Do. C	128—131	100—105	...
100,000	50	,,	12	60/-	Primitiva Ord.	118—121	97—102	98⅛—99
290,069	5	—	8	—	Do. 5 p.c. Pref.	5⅛—6	⅛—⅜	10/—12/6
499,960	5	—	5	—	Do. 4 p.c. Deb.	4⅛—5	2—2½	38/9—48/9
521,600	100	Nov. 30	4	4%	Do. ,, ,, 1911	91—93	68—73	...
600,000	Stk.	Jan. 25	4	4%	River Plate 4 p.c. Deb.	..	55—60	55⅛—58
346,198	,,	Dec. 29	4	4%	San Paulo { 6 p.c. Pref.	85—87	53—58	...
150,000	10	Sept. 21	6	6/-	San Paulo { 5 p.c. Deb.	10⅛—11	5⅛—6⅛	...
125,000	50	July 3	5	5%	Sheffield A	47—49	36—38	...
135,000	Stk.	Aug. 24	10	5%	Do. B	223—224	96—98	...
209,984	,,	,,	10	5%	Do. C	222—224	96—98	...
525,500	,,	,,	10	5%	Shrewsbury 5 p.c.	220—222	96—98	...
133,201	Stk.	Sept. 15	4	4%	South African	..	..	...
90,000	10	Nov. 2	9	7%	South Met. Ord.	10⅛—11⅛	7—9	7⅛
6,609,895	Stk.	Feb. 22	5/4/0	60/-	Do. Red. Pref.	111—113	93—95*	93½—95
250,000	,,	Jan. 11	—	5%	Do. 3 p.c. Deb.	..	95—97	95
1,895,445	,,	,,	3	3%	Do. 6½ p.c. Deb.	72⅛—74⅛	59—62	61—62
734,000	,,	Sept. 7	—	6½%	South Shields Con. Stk.	..	105—107	106⅛
91,500	,,	Feb. 22	8½	8½%	S'th Suburb'n Ord. 5 p.c.	157—159	115—117*	...
1,087,795	,,	,,	6	6%	Do. 5 p.c. Deb. Stk.	114—116	97—100*	98—98⅛
368,837	,,	Dec. 29	5	5%	Southampton Ord.	116—118	93—98	...
647,740	,,	Nov. 2	5	7%	Do. 4 p.c. Deb. Stk.	99—102	80—83	...
121,275	,,	Dec. 29	4	4%	Swansea 7 p.c. Pref. Stk.	..	68—73	...
250,000	,,	Aug. 24	—	218	Do. 6½ p.c. Deb. Stk.	..	103—105	...
200,000	,,	Dec. 29	—	202	Tottenham District { A 5 p.c.	..	101—103	...
120,000	,,	Feb. 22	—	7½%	Tottenham District { B 3½ p.c.	135—138	109—114*	...
782,275	,,	,,	6	6%	Tottenham District { 4 p.c. Deb.	115—117	95—101*	98½—100½
182,255	,,	Dec. 14	4	4%	Tynemouth 5 p.c. max.	87—89	75—80	...
258,251	Stk.	Aug. 24	5	3½%	Wandsworth, Wimbledon, and Epsom—	108½—109	81—83	...
30,000	,,	Feb. 22	8½	87/6	Wandsworth A 5 p.c.	151—156	108—112*	...
255,636	,,	,,	6½	72/6	Do. B 3½ p.c.	129—134	98—103*	...
108,075	,,	,,	—	61/3	Do. C.	..	86—91*	...
140,865	,,	,,	—	61/3	New Ordinary	..	86—91*	...
352,000	,,	,,	6½	68/9	Wimbledon 5 p.c.	117—122	93—98*	95
98,000	,,	,,	6½	73/9	Epsom 5 p.c.	121—126	98—103*	...
88,416	,,	Dec. 29	3	3%	3 p.c Deb. Stk.	66—69	56—59	...

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Imperial Continental Gas Association.—The Directors of the Imperial Continental Gas Association propose a final ordinary dividend for 1922 at the rate of 5 p.ct. actual, less tax, making 10 p.ct. for the year. They further propose that the sum of £238,698 received from the realization of the German assets be dealt with as profit, and applied in payment of a special dividend for the year at the rate of 12 p.ct. per annum.

Worthing Gas Company.—Mr. William Cash (the Chairman) moved, at the half-yearly meeting, the adoption of the report, which showed that the Company had further reduced the price of gas, as from the Lady Day readings, to 1s. 1d. per therm, while at the same time raising the calorific value to 500 B.Th.U. The profit and loss account exhibited a balance of £20,616; and out of this the Directors recommended a dividend of 5½ p.ct. per annum upon the consolidated ordinary stock for the half year ended Dec. 31. The Chairman thought they would agree that the accounts showed a very satisfactory position of affairs. There had been a substantial reduction in the cost of coal, and there had been a smaller quantity consumed. There had also been a big drop in the receipts from the sale of residuals; but even when this was considered, their net price for coal showed a reduction. Wages and gratuities displayed a marked diminution. Reduced receipts from the sale of gas had been due to the fact that the price was down. There had been three reductions. The profit earned during the half year showed an increase, and they had been able to declare the statutory dividend. Alderman Denton said the balance-sheet was one of the best they had had for many years. Worthing was growing very rapidly. The report was adopted, and the dividend declared.

It was reported to the Blackpool Gas Committee that the net balance for the year of £23,539 was a record for the undertaking. The income was £193,112; working expenses, £152,788; gross profits, £41,034; and mortgage interest, £17,500.

The Sunderland Gas Company last week had a sale of £25,000 of ordinary stock, maximum dividend 6 p.ct. The first lot was sold at £111. The price then gradually fell to £106; and the bulk of the stock was sold at £107 and £108.

There are important developments going on in the Chesterfield district which will mean a largely increased demand on the resources of the municipal gas undertaking. Already they have been asked to provide gas for the Tapton district, where extensive public improvements are being carried out.

The Worcester Coroner (Mr. Hulme) inquired on Tuesday evening last into the death of Mrs. Helen Ward (78), who was found on Sunday in her room suffering from gas poisoning. The evidence showed that she had a small gas-stove in her bedroom, which was connected with the main pipe by a piece of flexible tubing. On Sunday morning the tubing was found detached from the stove. The stove tap was turned off, but the tap of the main pipe was turned full on. The suggestion was that the tubing became detached, perhaps by deceased's touching it when she turned the stove off. A verdict of "Accidental death from carbon monoxide poisoning" was returned.

The third annual dinner of the Commercial Gas Company's Recreation Club was held at Pinoli's Restaurant on the 23rd ult. Mr. Alwyne Meade, Works Engineer, presided over a very large attendance. The principal toasts were "The Club," proposed by Mr. S. Copeman and responded to by Mr. W. Fisher (Hon. Secretary), and "The Visitors," proposed by the Chairman and responded to by Mr. F. E. Hamer. Reference was made in the course of the speeches to the men's interest in the Club as a social centre, and to its excellent effect in promoting a good understanding throughout the entire staff. The Chairman, in acknowledging the toast of his health, referred to the loyal support of all engaged in the works, and to the co-operative spirit in which all worked together for the good of the undertaking. An interesting musical programme was carried through.

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